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Problem-Seeking In Teacher Education: Empowering Students To Grapple With The Complexities Of The Profession

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Abstract. Preparing teachers for the realities of the profession is an ongoing concern for teacher education providers. In a climate where the future of teaching is largely unknown and the issues to be faced by teachers throughout their career largely imagined, the ability to identify and solve problems becomes increasingly important. This paper documents an evaluation of a pilot approach to preparing pre-service teachers for the realities of their profession. This approach, which centred on students utilising mobile technologies to problem-seek, was evaluated in terms of students' perceived preparedness for the profession and their development of problem-solving skills and strategies. Results suggest that participating and engaging in the project may have in part contributed to reducing students' anxiety around solving real-world problems, and improved their familiarity and preparedness for going into classroom settings.

Introduction

Many professions have documented the problems created where discrepancies exist between what students learn at university and the realities of the workforce (Roth, 2010). Applying the knowledge and skills acquired during tertiary learning in a real-world workplace is a daunting task for young professionals. New graduates need to be equipped to grapple with the realities of the job, prioritising attention amidst competing stimuli and coping with the multifaceted complexities of real-world problem-solving. Without such skills, graduates can find themselves with simplistic notions of the workplace and may not be able to engage successfully as professionals. In the case of teachers, we know that the early years in the profession can result in stress, praxis shock and sometimes burnout (Ballantyne, 2006; 2007, Billett, 2002; Burnard, 2013; Kim & Cho, 2014; Piihl & Philipsen, 2014; Roth, 2010; Sheridan, 2016). One of the challenges faced by teacher education institutions is that graduates are being prepared to teach in increasingly unforeseen, unknowable and imagined future contexts. Accordingly, pre-service teachers must possess the 'real world' skills in solving 'authentic' problems, as they encounter them (Heikonen, Pietarinen, Pyhältö, Toom, & Soini, 2017).

'Authentic learning' in teacher education is typically located in traditional practicum placements. Traditional practicums certainly go some way towards preventing future praxis shock by facilitating peer collaboration (Ballantyne & Olm-Madden, 2013; Draper & Hitchcock, 2006; Reeves, Herrington, & Oliver, 2002), building professional networks and exposing pre-service students to complex and multi-dimensional problems which require the building of prior-understanding (Sternberg, Wagner, & Okagaki, 1993). While practicum placements go some way towards preparing pre-service teachers for the 'real-world',

additional resources are needed over and above current provisions to address the praxis shock reported by early-career teachers (Ballantyne & Retell, 2020; Ballantyne & Zhukov, 2017; Kim & Cho, 2014). Indeed, there is evidence that much can be accomplished with pre-service teachers before they embark on a practicum by allowing them to observe real workplaces and engage with problem-solving *in-situ* (Danyluk, 2013).

While problem-based learning (PBL) plays a role in pre-empting the university-workplace divide, PBL alone is arguably insufficient to simulate the complexities of the workplace. The sheer variety of contexts and issues encountered by teaching professionals at the beginning of their careers cannot possibly be captured in a constructed or simulated case study situation (Ballantyne et. al. 2009; Ballantyne & Olm-Madden, 2013). Facilitating the development of problem-solving skills is something that enables pre-service teachers to gain confidence in the classroom. It allows them to act proactively, rather than reactively when they find themselves in front of a class. Crucially, problem-solving should connect pre-service teachers with the highly salient components of ‘real-world’ learning opportunities.

This paper reports on a pilot project which utilised a new curriculum model, embedding discipline interests within a work-integrated approach to problem-solving and community collaboration as an alternative approach to complement practicum placements in pre-service teacher education. As described in Ballantyne (2017), the intent was to “use mobile technologies to allow students to construct their understandings of the challenges faced in the profession, using problem-based learning and reflective practice [and]...to increase the relevance of university study to the ‘real world’, linking the reality of teaching with university training” (p. 577), thereby lessening the gaps existing between expectation and reality in future music teachers. Thus, in this pedagogy, students were encouraged to spend time observing, and to find an issue (or problem) that they felt would be relevant to them, as though they were the teacher in the school. Students were asked to enter real classrooms and use mobile technological devices, such as iPhones and iPads, to conceptualise, record, and frame the problems. The project design emphasised the development of this ability to ‘frame’ the issue (identifying what the ‘problem’ is, together with its component parts), and the ability to explore the complexities of the issues surrounding identified ‘problems’. The process was intrinsically collaborative, as students were asked to use peer support in problem-solving, but was also structured to require the application of theoretical knowledge, as well as fundamental problem-solving, interpersonal and intrapersonal skills. Thus, the project centred around having students engage in ‘problem-seeking’ to develop their strategies to deal with complex and multifaceted practice-based problems.

It should be noted that the notion of problem-seeking is similar to that of problem-finding (Reiter-Palmon, 2011), in that it focusses primarily on the initial stages of understanding issues that may exist in real contexts. We prefer the term ‘problem-seeking’, as it emphasises the idea that the interesting or challenging problems to be solved may not be initially apparent, or indeed solve-able. It is through the process of seeking the problems, framing them, and then presenting the framed problems to colleagues for feedback, that students develop skills that may be useable to them as professionals in the future.

The current project aimed to develop and trial a pedagogical approach addressing issues of problem seeking and work-integrated learning, embedded within an existing course. Furthermore, the pilot study attached to this pedagogical approach (entitled ‘Mobile Technologies Project’), aimed to evaluate the efficacy of the pedagogy and whether it improved students’ problem-solving skills and strategies, thereby improving their preparedness for the profession specifically in relation to aspects of praxis shock and core competencies (Ballantyne 2017).

Method

Participants

Twenty-seven pre-service teacher education (PSTE) students (80% female) enrolled in a university education course consented to participate in the study. The average age of participants was 20.4 years (SD = 20.4), with 82% of participants enrolled in a double degree (e.g. Bachelor of Arts and Bachelor of Education) and over half the sample completing a Major in Music. Of the 27 PSTE students who consented to participate in the study, five were excluded entirely from the analyses due to systematic missing data on either the pre- or post-test. Therefore analyses were conducted on a total of 22 participants. Ethics approval was obtained from the university, and individual approvals were sought from participating school principals, teachers and parents of children. PSTE students were recruited during the first classes of the university course and data derived from PSTE students' participating in learning activities embedded within their university subject. While all PSTE students in the university subject participated in the learning activities, data was only gathered from those participants who consented to participate in the research component of the subject.

Measures

The Social Problem-Solving Inventory-Revised Short Version (SPSI-R:S; D'Zurilla, Nezu, & Maydeu-Olivares, 2002) is a 25-item self-report scale designed to provide an overarching indication of general problem-solving ability, with respondents rating items according to a 5-point Likert scale (0 = not at all true, 4 = extremely true of me). The inventory consists of five sub-scales which measure individual's specific strengths and weaknesses in different dimensions of social problem-solving, including Positive Problem Orientation (PPO), Negative Problem Orientation (NPO), Rational Problem-solving (RPS), Impulsivity/Carelessness Style (ICS), and Avoidance Style (AS). Psychometric testing has shown the SPSI-R:S to have good internal validity and reliability (D'Zurilla et al., 2002; Dreer et al., 2009).

Information was also gathered using a self-report questionnaire designed for use in the current study, which utilised a combination of Likert-scale self-report measures alongside open-ended questions, allowing for the collection of both quantitative and qualitative data.

The study questionnaire utilised a combined framework, developed from a range of sources detailing core teaching competencies from around the world (See Appendix A). Students were asked to rate on a 5-point Likert scale (1 = not at all; 5 = very much) their perception of the degree to which they had developed core teaching skills throughout their university studies to date (pre-MTP) and following participation in the Mobile Technologies Project (post-MTP). Students were asked about their self-reported preparedness and anxiety regarding entering the teaching profession and their perceptions regarding the degree to which university learning activities had prepared them for entry into the teaching profession. These were measured on the same 5-point Likert-scale both pre- and post-MTP. A final open-ended question (post-MTP) relevant to this paper asked students "*What things did you learn about your chosen profession that you didn't know prior to participating in the Mobile Technologies Project?*".

Study Design and Procedure

This mixed-methods pilot study measured the impact of the mobile technologies pedagogical approach, utilising a

- single-group repeated measures design with two measurement points: pre-MTP course (Time 1) and post-MTP course (Time 2), as well as
- qualitative responses to questions relating to the pedagogical design employed.

Pre-service teacher education (PTSE) students enrolled in a university music-teacher education course were each assigned to a specific classroom and school within metropolitan Brisbane, Australia. Embedded within the traditional components of this course were the activities of the current research project. The authors were not teaching the class where the project took place. Students were introduced to the project by Author 1 and handed the pre-questionnaire in week one (of 12). Over the subsequent nine weeks, students were required to attend their assigned school classroom three times for approximately two to four hours per visit. Unlike traditional placements, these on-site visits were purely observational, and students were instructed to identify and document a challenge in the classroom related to any aspect of the classroom environment. Once a challenge was identified, students were to utilise mobile recording devices (such as i-pads, i-phones/smartphones) to document and develop an electronic portfolio of images, sounds, web resources and documents capturing the identified challenge from a multiplicity of vantage points. The instructions given to the students were:

The focus of observation is to document a challenge which you have identified in the classroom and which can be related to any aspect of the classroom environment. While identification and documentation of this challenge should be largely based on your own observations and reflections, you may choose to discuss this with the classroom teacher to identify an existing challenge in the classroom and to facilitate non-obtrusive observation.

You will share your electronic portfolio with other ... students in tutorials and collaborate to identify a workable and evidence-based solution to the classroom challenges identified. You may then return to the school (i.e., liaise with your lecturer and the participating classroom teacher to arrange this) to discuss the solution, after which you will complete a final write-up of the solution and submit the Electronic Portfolio and the Final Problem Solution¹.

In week 10 (of 12), students engaged in a three-hour-long ‘problem-solving’ session where teachers from the selected schools, lecturers and university observers were also invited to attend. In this session (facilitated by Author 1), small groups of students shared their ‘framed problem’ as it existed on their mobile device. They were provided with a brief problem-solving framework to guide their discussion and then engaged in a collaborative process of identifying workable and evidence-based solutions to the challenges identified. They were also asked to give feedback to the authors of the ‘framed problem’, in terms of how clear the problem was, and how useful the collected artefacts were in assisting them in ‘solving’ or understanding the problem. This reflexive process enabled students to problematize the process of problem-framing and problem-solving in a school context. It also engaged the relevant teachers in discussing the broader issues surrounding the different school and classroom contexts. After completion of the course (Time 2), students were asked to fill in the post-MTP course questionnaire.

¹ The submission by students comprised a very small percentage of their assessment for the course, and was marked by the lecturer (not any of the authors).

Analyses

A combination of quantitative and qualitative methods was used in the current study. All quantitative data were handled and analysed using SPSS version 23. Prior to analyses, data was evaluated in terms of its suitability for parametric significance tests. Data met assumptions (e.g. normality) for the use of parametric tests. Thus, while the sample size is low (e.g. <25), it represents 81% of students involved in the pedagogical intervention and inferential statistics will still provide valid insights for this pilot study. Additionally, Hertzog (2008, p. 190) states that “if the aim of the pilot study is to demonstrate intervention efficacy in a single group, a sample in the range of 20-25 would probably be adequate”.

Braun & Clarke’s approach to (2006) thematic analysis was used to analyse qualitative data from the questionnaire with inter-rater coding implemented to establish the validity of themes (Creswell & Creswell, 2018). Overall, considering the current research was a pilot study, results should be considered in terms of their capacity to shed light on likely usefulness of further investigation of the uncovered themes.

Results

Pre-Service Teachers’ Perceived Preparedness for the Profession

As shown in Table 1, paired sample t-tests were used to determine any overall mean changes in pre-service teacher education (PSTE) students' self-reports on the effectiveness of their overall studies to date and specifically the mobile technologies project (MTP) in addressing leading aspects of praxis shock such as anxiety and preparedness. Effect sizes were calculated to provide a qualitative measure of the magnitude of differences observed between pre- and post-test means. Effect sizes were interpreted as small (0.2), medium (0.5) or large (0.8) in relation to the guidelines expressed in Cohen (1988).

Statistically significant differences in the pre- to post-tests were found between multiple items including PSTE students' perceptions of their anxiety about going into the field, their understandings of the classroom and perceived relevance of their university studies to the real world. Significance was also found when comparing the degree to which the MTP course had improved their familiarity with school and classroom settings, preparedness to do field-based placements, and decreased anxiety about doing field-based placements. No significant change was found in PSTE students’ self-reported preparedness or anxiety about becoming a teacher or familiarity with specific teaching techniques. All statistically significant differences were associated with medium effect size, except for the comparison of student’s self-reported familiarity with the classroom, which was associated with a large effect size after engagement in the MTP.

Item	Pre-Test		Post-Test		df	t-test		Effect Size
	M	SD	M	SD		T	p-value*	
“Overall, how prepared do you feel for your chosen career?”	2.91	0.75	3.05	0.58	21	-0.680	0.504	-0.1
“Overall, how anxious do you feel about going into the field?”	3.36	1.09	2.86	1.13	21	2.318	0.031**	0.5
“Overall, how anxious do you feel about becoming a teacher?”	2.82	1.22	2.73	1.12	21	0.400	0.693	0.1
“Have your university studies to date improved your understanding of the classroom?”	2.95	1.05	3.64	0.90	21	-2.56	0.018**	-0.5
“Have your university studies to date been “relevant” to the “real world?”	2.82	1.10	3.23	0.87	21	-2.61	0.016**	-0.6
“Have your university studies to date prepared you for your chosen career?”	2.82	0.96	2.95	0.72	21	-0.55	0.589	-0.1
The degree to which your involvement in the MTP has . . .								
“Increased your familiarity with school and classroom settings “	2.36	0.90	3.45	1.10	21	-4.16	0.000**	-0.9
“Increased your familiarity with teaching techniques”	3.00	0.82	3.50	1.06	21	-1.80	0.086	-0.4
“Helped you feel more prepared to do field-based placements”	2.50	0.80	3.18	1.10	21	-2.83	0.010**	-0.6
“Decreased your anxiety about doing field-based placements”	2.23	0.87	3.00	1.38	21	-2.45	0.023**	-0.5
“Helped you feel more prepared for being a teacher”	2.64	0.79	2.82	1.14	21	-0.66	0.518	-0.1
“Decreased your anxiety about being a teacher”	2.68	0.80	2.68	1.21	21	-1.80	0.086	-0.4
*two-tailed								
** significant at 0.05								

Table 1: Paired Sample T-Test Pre-MTP and Post-MTP Comparing PSTE Student’s Evaluation of Key Praxis Shock Factors (e.g., Anxiety, Sense of Preparedness, Familiarity with the Classroom Setting)

Development of Teaching Competencies

As above, paired sample t-tests, in conjunction with effect sizes, were used to determine any overall mean changes in PTSE students' self-reports of the effectiveness of the Mobile Technologies Project (MTP) in developing core teaching competencies. Results indicated statistically significant differences in six of the 21 self-reported competencies. As shown in Table 2, PTSE students were significantly more likely to report that the MTP course had contributed to improving their understanding of the learning environment and

specific teaching activities. These activities included managing challenging behaviour and preparing classroom activities, which were associated with large effect sizes, and implementing curriculum, organising the learning environment, as well as explaining and demonstrating concepts, which were associated with medium effect sizes. Interestingly, PSTE students were significantly less likely to report that the MTP had contributed to their understanding of diversity and disability ($t(21) = 3.102, p=0.01$) and this finding was associated with a medium effect size.

Item	Pre-Test		Post-Test		t-test			Effect Size
	M	SD	M	SD	df	T	p-value*	d
Knowledge of learners and their characteristics	3.23	0.81	2.64	1.14	21	1.846	0.079	0.4
Understanding of diversity and disability	3.41	0.91	2.41	1.23	21	3.102	0.005**	0.7
Ability to cater to student needs	3.23	0.87	2.95	1.00	21	0.972	0.342	0.2
Understanding of how to establish learning goals	2.59	0.80	2.59	1.14	21	0.000	1.000	0.0
Understanding of how to plan and sequence lessons	1.91	0.75	2.32	1.05	21	-1.904	0.071	-0.4
Understanding of how to select and use resources	2.32	0.78	2.68	0.95	21	-1.449	0.162	-0.3
Understanding of how the learning environment should be organised	2.41	1.10	3.05	1.13	21	-3.309	0.003**	-0.7
Understanding of teaching and learning strategies	2.77	0.92	3.05	0.95	21	-1.000	0.329	-0.2
Understanding of methods to explain and demonstrate concepts	2.36	1.05	3.05	1.00	21	-2.560	0.018**	-0.5
Understanding of subject content	2.95	1.36	2.77	1.07	21	.463	0.648	0.1
Understanding of effective classroom communication	2.55	1.01	3.23	1.28	21	-2.057	0.052	-0.4
Understanding of implementation of curriculum	2.09	0.87	2.77	1.16	21	-2.190	0.040**	-0.5
Understanding of methods of assessing learning	2.36	0.79	2.73	1.28	21	-1.283	0.213	-0.3
Understanding of the role of feedback and assessment in modifying teaching practice	2.91	1.27	2.73	1.32	21	0.581	0.568	0.1
Ability to manage classroom activities	2.18	0.85	3.05	1.05	21	-3.743	0.001**	-0.8

Understanding of strategies to manage challenging behaviours	1.64	0.66	2.73	1.24	21	- 3.626	0.002**	-0.3
Understanding of how to maintain a safe classroom environment	2.32	1.17	2.64	0.90	21	- 1.195	0.246	0.2
Understanding of how to engage parents/carers and ensure sensitivity and confidentiality	2.00	1.07	1.73	1.03	21	0.826	0.418	-0.4
Understanding of methods of collaborating and interacting with other teachers	2.36	1.14	2.82	1.26	21	- 1.865	0.076	-0.2
Understanding of the role of professional development	2.41	1.01	2.64	1.22	21	- 0.839	0.411	-0.2
Understanding of overall standards of professional practice	2.73	1.24	3.05	1.21	21	- 0.960	0.348	-0.3

*two-tailed

** significant at 0.05

Table 2: Paired Sample T-Test Comparing PSTE Students' Pre- and Post' Reports of Preparedness Based on Core Teaching competencies

Problem-Solving Skills

Problem-solving ability before and following participation in the Mobile Technologies Project (MTP) was evaluated using the Social Problem-Solving Inventory–Revised Short Version (SPSI-R:S). Paired sample t-tests and effect size calculation using Cohen's d were used to determine any overall mean changes in PSTE students' self-reports of their problem-solving ability before and after engagement in the MTP (see Table 3). Results indicated a significant reduction in negative problem-solving behaviours (NPO) before (M=97.13, SD=10.75) and after (M=93.65, SD=11.01) participation in the MTP ($t(21)=2.088, p=0.049$). However, this was only associated with a small effect size. No significant differences were detected on any of the other problem-solving subscales (refer to Appendix B for a full description of traits associated with each subscale).

Item	Pre-Test		Post-Test		t-test			Effect Size
	M	SD	M	SD	df	T	p-value	d
Total	107.04	7.53	106.91	8.34	22	0.092	0.928	0.02
Positive Problem Orientation Scale	103.39	8.59	101.09	11.45	22	0.852	0.403	0.18
Rational Problem-solving Scale	102.26	12.35	102.43	11.68	22	-0.074	0.941	-0.02
Negative Problem Orientation Scale	97.13	10.75	93.65	11.01	22	2.088	0.049**	0.44
Impulsivity/Carelessness Style Scale	88.70	11.38	90.17	10.30	22	-0.745	0.464	-0.16
Avoidance Style Scale	94.74	11.20	94.74	12.55	22	0.000	1.000	0.00

Table 3: Paired Sample T-Test Comparing PSTE Students’ Pre- and Post- Social Problem-Solving Attributes

Professional Insights

To contextualise the quantitative results, pre-service teacher education (PTSE) students were asked to articulate new insights they had developed in regards to the teaching profession following their participating in the Mobile Technologies Project (MTP). Nineteen PSTE students responded to an open-ended item at the end of the post-MTP questionnaire. Qualitative data was then inductively analysed using Braun & Clarke’s (2006) six-phase approach to thematic analysis process. Following inter-coding validity checks, four overarching themes were revealed, indicating areas of knowledge growth for pre-service teachers as a result of participation in the MTP. The first theme, **“Diversity and equity”** saw PSTE students articulating the development of greater insight into these converging constructs and the challenges teachers face daily of having to work with a *“diverse range of skills and abilities”* [RJ1806; RH1006] whilst making sure that *“every child [is] given a chance to learn”* [AM2201]. The second theme, **“Fluidity”** enabled PSTE students to reflect on the ever-changing classroom landscape that demands teachers to be adaptable and flexible, *“constantly evaluating, processing and adapting to the classroom throughout the day”* [KB2310]. In response to this fluidity, students started to develop a more nuanced understanding of the environment, being able to recognise that *“not every solution is a perfect fit”* [JG1011]. Theme three, **“Temporality”** provoked PSTE students to contemplate the experience of time in the classroom, with students conveying a wide variety of reflections across the continuum ranging from a sense of immediacy (*issues within the classroom need to be solved immediately*) [AM2201] to more measured responses (*not all [problems] can have a quick solution or a solution at all*) [ML0106], through to considerations of time in a broader sense that provokes the question of keeping education relevant (i.e. *“music in the classroom is changing..... importance of implementing technology”*) [TA1912; XX1211].

Finally, PSTE students were provoked to consider the “*Practicalities*” of the profession ranging from assessment and curriculum considerations through to behaviour management strategies.

Discussion

The aim of this pilot study was to trial a novel pedagogical approach that utilised mobile technologies to help pre-service teacher education (PSTE) students improve their problem-solving skills and strategies. The pedagogy was designed to better prepare them for the aspects of the profession related to praxis shock and core competencies. Overall, results suggest moderate support for the hypotheses with significant improvements reported across aspects of all domains.

Preparedness

Prior to the project, most students reported that their tertiary studies to date had not improved their understanding and familiarity of the classroom or been relevant to the “real world”. To contextualize this, most of the students in this course had not had prior practicum experiences or indeed undertaken many courses in the ‘education’ component of their degree. It is perhaps unsurprising, therefore, that none of the students reported that their studies had significantly reduced their anxiety about practical interactions in real classrooms, either as a practicum student or an early-career teacher (e.g., only around 1-2% of students indicated that studies had reduced anxiety either “a lot” or “very much”). So, while some students reported positively on the relevance and usefulness of their university studies to date and felt prepared to function as working teachers, at least some expressed concern about the link between the course content and the looming need for them to perform practical tasks. Research by Danyluk (2013) found that pre-service teachers reported anxiety both before their first practicum and during practicum. As highlighted by the findings in this current study and echoed in the literature, feelings of anxiety and poor preparedness are closely linked to concerns around evaluation, classroom management and staff relations (Ballantyne, 2006b; Paker, 2011). Following participation in the MTP, results suggest that engagement may have in part contributed to reducing PSTE students’ anxiety and improving their familiarity and preparedness for going into classroom settings during field placements. They reported a better understanding of the ‘real world’ and an increased understanding of the classroom. Students’ qualitative responses in this study confirmed that they were largely interested and concerned with “practical” issues faced by teachers in the classroom. Issues that emerged as important in this study included managing behaviour, adapting to changing classroom requirements, responding to diversity and motivating students as an early-career teacher.

Students indicated in their qualitative responses (“fluidity” category) that throughout the project, they had developed an understanding of the importance of continually adapting to changing teaching environments. Furthermore, flexibility as a pedagogue and professional was perceived by these students as being key to their preparedness as future teachers. These findings suggest that the problem-seeking/solving pedagogy reportedly went some way to assist these students in feeling better prepared for some of the complexities that they are likely to face in their future workplaces. The pedagogy of this project supported students seeking issues that they felt were relevant, and the trialling of framing and re-framing these issues through collaborative work with colleagues and the teachers. The emergent

“practicalities” theme supports the notion that students specifically gained confidence over the project in areas of assessment, curriculum and behaviour management. Given the various layers in the pedagogy employed (i.e. the use of mobile technology; problem seeking; work-integrated learning) it is difficult to ascertain whether one aspect of the pedagogy was more efficacious or if indeed, the culmination of all strategies employed attributed to overall gains in confidence. Future studies are warranted to tease this further apart.

Core Teaching Competencies

Findings suggest that involvement in the MTP significantly improved participants’ perceived abilities across six core teaching competencies (out of 21). Interestingly, the core competencies where PSTE students saw significant improvement directly reflected areas that they self-selected to focus on during their engagement in the MTP pedagogy. Although the analysis of students’ representation of their issue (e-portfolio) is not a focus of this paper, the areas selected as ‘problems’ by the PSTE students included behaviour management, curriculum design issues, managing curriculum and resources. These areas are often easily observable in a working classroom, and therefore may reflect students’ choice to focus on the immediacy of curriculum design and classroom management during their first classroom observation experience, and thus to seek problems that pertain to these domains. Students’ qualitative responses further supported this focus; students emphasised the importance of “practical” issues faced by teachers in the classroom. They sought to frame problems in areas that are perceived to be important to their future professional growth, easily observable in the classroom, and tied to areas of reported anxiety as future music teachers (as discussed above).

Although students showed reduced improvement in their understanding of diversity and disability in the quantitative component of the questionnaire, their qualitative responses through the theme “*Diversity and equity*” suggest that some students were beginning to see the complexities involved in addressing issues of diversity in the classroom (although not necessarily reflecting an increased understanding of catering to disabilities in the classroom). Grappling with issues of diversity emerge from an ability to be self-aware and self-reflective (Mills & Ballantyne, 2010; Ballantyne & Mills, 2015; Mills & Ballantyne, 2016). These findings may also reflect the sensitivities, complexities and ‘hidden’ nature of diversity issues.

Students reported that the MTP helped them improve across some core teaching competencies, the modest findings suggest there is space for further refinement. Future applications of similar pedagogies may find it beneficial to target specific competencies, although it is possible that this will then negate the benefits of the student-identified problem-seeking approach.

Problem-Solving Skills

- Social problem-solving skills are likely to be required by new teachers as they adapt to the challenges of their early career. One of the main aims of this current pilot study was to trial a pedagogy that would specifically target problem-solving abilities in pre-service teachers, prior to them having to solve problems in practicum/on the job. This pedagogy focussed attention on the problem-seeking component of problem-solving, as it was expected that this skill was fundamental in enabling teachers to productively manage the often overwhelming and competing issues to be addressed as they traverse through their early years in the profession. It was hoped that strong social problem-solving skills might go some way

towards protecting individuals against aspects of early-career praxis shock. Results of the current study evaluated the effectiveness of the MTP in targeting five different behaviour styles relevant to problem-solving (positive, negative, rational, careless and avoidant styles) ability and strategies. Although results only showed significant improvement for negative problem-solving ability, this finding suggests that students were less likely to report viewing problems as threatening to their well-being, feeling unable to solve problems and become frustrated and upset when facing problems following participation in the MTP. If this finding is associated with involvement in the MTP, then this project has identified a pedagogy which may reduce individual's levels of emotional distress while problem-solving and increase the likelihood that they will solve problems effectively. This finding aligns with the qualitative category of "temporality", which highlighted how the pedagogy helped to reframe and contextualise students' understanding of the concept of time in relation to problem-solving. By providing students a better understanding of the considerations and realities of problem-solving in the classroom (for example, that some problems may not be immediately solvable), students may feel more empowered to grapple with the complexities and frustrations when initially encountering problems.

Conclusions

Results suggest that participating and engaging in the Mobile Technologies Project may have in part contributed to reducing pre-service teacher education students' anxiety and negative problem-solving skills and improving their familiarity and preparedness for going into classroom settings during field placements. This project provides one example of a way to focus students' attention on developing skills to seek and solve problems that they may encounter in real-life contexts. By providing ample opportunities for pre-service teachers to engage with real-world experiences in a variety of ways, for a variety of purposes, teacher education program should be able to move towards better equipping graduates with relevant problem-solving skills that might mitigate against the disastrous effects of early-career teacher stress. Consequently, these students may enter subsequent placements with greater confidence (Danyluk, 2013), which in turn may allow students to profit greater from practical learning opportunities.

Limitations

The MTP evaluations could not control for potential confounding factors (e.g., the most likely of which is the content of studies over this semester). Indeed, the qualitative data reported above indicated that participation in the MTP and the particular course contributed at least in part to students' increased sense of preparedness. Again, while statistical significances noted cannot be solely attributed to participation in the MTP given various other uncontrolled and potentially confounding factors, students' comments give credibility to the argument that participation in the MTP at least contributed to the amelioration of potential risk factors for praxis shock which occurred over the course of the semester in question. That is, the data presented in this paper suggests that problem-seeking in the pre-service teacher education classroom is helpful (alongside other strategies) in preparing teachers to solve real problems that face teachers. Further investigation is required to fully understand the extent to which pre-placement problem-based learning impacts pre-service teacher's future learning and early-career teaching experiences.

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Appendix A

Comparison of Professional Standards Used for Development of Core Competencies in the Questionnaire

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
	Knowledge of <i>learners</i> and their characteristics	1.1 Understanding of the physical, social and intellectual development and characteristics of students	1. Knowledge of how learners grow and develop and understanding that learning and development vary individually within and across the cognitive, linguistic, social, emotional and physical areas	
		1.2 Understanding of how students learn		K3 How students learn, both generally and within their subject area
Understanding of diversity and disability	Ability to cater to student needs	1.3 Understanding of students with diverse language, culture, religious and socioeconomic backgrounds	2. Understanding of individual differences and diverse cultures used to ensure an inclusive learning environment	V1 Respect Individual learners and diverse learning communities
		1.4 Understanding of strategies for teaching Aboriginal and Torres Strait Islander students		V2 Promote participation in higher education and equality of opportunity for learners

² AITSL (Australian Institute for Teaching and School Leadership)

³ CCSSO (Council of Chief State School Officers)

⁴ HEA (Higher Education Academy)

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
Understanding of teaching and learning strategies	Understanding of methods of <i>explaining and demonstrating concepts</i>	1.5 & 1.6 Understanding of strategies for teaching students with disability and across a range of abilities 2.1 & 3.3 Understanding of teaching strategies and content within the teaching area	4. Understanding of central concepts, tools of inquiry and structures of the discipline	A1 Design and plan learning activities and/or programmes of study A2 Teach and/or support learning
Understanding of subject content	Understanding of <i>instructional strategies/teaching techniques</i>	2.2 Understanding of how to organise and select content	4. Creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to ensure mastery of the content	K1 The subject material
Understanding of effective classroom communication		2.5 Understanding of literacy and numeracy standards	8. Uses instructional strategies to encourage learners to develop deep understanding of the content area	K2 Appropriate methods for teaching, learning and assessing in the subject area, at the level of the academic programme

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
		2.6 Understanding of how to use Information and Communication technology to expand learning		K4 The use and value of appropriate learning technologies
		3.5 Understanding of effective classroom communication		
		3.6 Broad knowledge of strategies used to evaluate teaching programs		
	Understanding of how the <i>learning environment</i> should be organised		3. Understanding of how to create a learning environment that supports individual and collaborative learning and encourages positive social interaction, active engagement in learning and self motivation	

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
	Understanding of implementation of <i>curriculum</i>	2.3 Understanding of how to use curriculum to design learning sequences and lesson plans		
Understanding of how to establish learning goals	Understanding of effective <i>lesson planning</i>	3.1 Understanding of how to establish challenging learning goals	7. Plans instruction that supports every student in meeting learning goals (e.g., drawing on content, curriculum, cross-disciplinary skills and pedagogy, as well as knowledge of learners)	
Understanding of how to plan and sequence lessons		3.2 Understanding of how to plan, structure and sequence learning programs		
Understanding of how to select and use resources		3.4 Understanding of how to select and use resources		
Understanding of how to engage parents/carers and ensure sensitivity and confidentiality	Understanding how to interact with parents	3.7 Understanding of how to engage parents/carers in the educative process		
		7.3 Ability to engage with parents/carers sensitively and confidentially		

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
Ability to manage classroom activities	Understanding of behaviour management strategies	4.1 Ability to support student participation		A4 Develop effective learning environments and approaches to student support and guidance
Understanding of strategies to manage challenging behaviour		4.2 Ability to manage classroom activities		
Understanding of maintaining a safe classroom environment		4.3 Ability to manage challenging behaviours		
		4.4 Ability to maintain student safety		
		4.5 Understanding of how to use ICT safely, responsibly and ethically		
	Understanding of methods of <i>assessing</i> learning	5.1 Understanding of assessment strategies	6. Uses multiple methods of assessment to engage learners in their own growth, to monitor progress and	A3 Assess and give feedback to learners

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
<p>Appreciation of the role of assessment in modifying teaching practice</p>	<p>Understanding of methods of collaborating and interacting with other teachers</p>	<p>5.2 Understanding of the purpose of providing timely and appropriate feedback to students</p>	<p>guid teachers/learners decision making</p>	<p>K5 Use methods for evaluating the effectiveness of teaching</p>
		<p>5.3 Understanding of the role of assessment moderation in supporting consistent and comparable judgement in student learning</p>		
		<p>5.4 Ability to interpret student assessment data to evaluate learning and modify teaching practice</p>		
		<p>5.5 Understanding of a range of strategies for reporting to students and parents/carers</p>		
		<p>6.3 Ability to engage with colleagues to improve practice</p>		

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
Understanding of the role of professional development to improve practice	Professional Development	7.4 Ability to engage with professional teaching networks and broader communities		
		6.1 Understanding of how to identify and plan professional learning needs	9. Use of evidence to continually evaluate practice.	A5 Engage in continuing professional development in subjects/disciplines and their pedagogy
		6.2 Understanding of how to engage in professional learning and improve practice	9. Understanding of the need for ongoing professional learning.	K6 Understand the implications of quality assurance and quality enhancement for professional practice
Understanding of overall standards of professional practice	Knowledge of education purposes and values	6.4 Understand the link between continuing professional learning and improved student learning	7.1 Understanding of professional ethics	V4 Acknowledge the wider context in which higher education operates and recognise the implications for professional practice

Questionnaire categories	Categories from Ballantyne (2005)	Australian Standards (AITSL ² , 2012)	InTASC (USA) (CCSSO ³ , 2011)	UK Professional Standards (HEA ⁴ , 2011)
		7.2 Ability to comply with legislative, administrative and organisational requirements		
	Other	2.4 Understanding of how to promote reconciliation between Indigenous and non-Indigenous Australians		
			10. The teacher seeks appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate. . . and to advance the profession	
				V3 Use evidence-informed approaches and outcomes from research, scholarship and continuing professional development

Appendix B

Social Problem-solving Inventory – Revised Scales (D’Zurilla, Nezu, & Maydeu-Olivares, 2002)

Positive Problem Orientation Scale (PPO): Measures cognitions around problem-solving. Individuals high in PPO are more likely to encounter problems as positively challenging, rather than threatening, to believe that problems are solvable and to feel confident in their ability as problem solvers. In addition, individuals who endorse this scale strongly are more likely to expect problems to require time, effort and persistence and be willing to engage in the process of problem-solving, rather than avoiding. Individuals high in PPO experience less emotional distress while problem-solving and, not unexpectedly, do better at producing solutions to novel problems.

Negative Problem Orientation Scale (NPO): In contrast, individuals high in NPO are likely to view problems as significantly threatening to well-being, to feel unable to solve problems and to become frustrated and upset when facing day-to-day problems. Individuals high in NPO experience high levels of emotional distress while problem-solving and are less likely to solve problems effectively.

Rational Problem-solving Scale (RPS): High scores on this scale indicate individuals who report using a problem-solving of careful and systematic fact gathering, identification of obstacles, setting of realistic and achievable goals for problem-solving, generation of a range of solutions, understanding and anticipation of consequences, accurate evaluation of various solutions and evaluation of the outcome. This scales assesses individual’s knowledge of systematic problem-solving as well as the extent to which individuals apply their knowledge to real-world problems. Individuals high in RPS are likely to be effective problem solvers.

Impulsivity/Carelessness Style Scale (ICS): Individuals high in ICS tend to problem-solve using strategies which are narrow, impulsive, careless, hurried or incomplete. High scores indicate that individuals are more likely to consider few solutions, choose solutions impulsively, scan alternatives and consequences unsystematically and fail to monitor solutions.

Avoidance Style Scale (AS): Individuals high in avoidance tend to respond to day-to-day problems with procrastination, passivity, inaction and dependency. Individuals with high AS scores are more likely to avoid problems for as long as possible, wait for problems to self-resolve and/or try to shift responsibility for problem-solving to others. Again, this is an ineffective problem-solving trait.