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# **Eportfolios in Initial Teacher Education in Singapore: Methodological Issues Arising From Initial Attempts to Make Meaning of Artifacts**

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## **Introduction**

Eportfolios were introduced into teacher education in the 1980s. Since then, educational researchers and practitioners have increasingly cited the use of portfolios as an important assessment and learning tool in teacher education programs. In the domain of teacher education, the need to improve quality, attain established standards and to resolve accreditation issues have led to the increased use of ePortfolios in many European states and others around the world (Granberg, 2010).

An electronic portfolio (ePortfolio) is often defined as “a digitized collection of artifacts, including demonstrations, resources and accomplishments that represent an individual, group, community, organization, or institution. This collection can comprise of text-based, graphic or multimedia elements archived on a Web site or on other electronic media (Lorenzo & Ittelson, 2005, p. 3).”

In pre-service teachers' ePortfolios, artifacts can be samples of work that include lesson plans, stimulus materials, videos, pictures and picture files, classroom assignments, classroom tests, newsletters, and in-service materials produced by the pre-service teacher (Bruneau & Bie, 2010). With the creation of ePortfolios, student teachers can document their journey in becoming a teacher by selecting, sharing, and reflecting on artifacts such as educational philosophies, classroom management plans, unit and lesson plans, plans to meet the needs of diverse and special needs pupils, and video clips of practice teaching (e.g., Strudler & Wetzel, 2005). They can not only showcase their best work as a professional, but also exhibit the knowledge and skills in using technology.

## **Artifacts in Student Teachers' Eportfolios**

Eportfolios can serve as authentic assessment tools that provide a rich repository of information about learning (Keino, 2006). As ePortfolios become institutionalized in teacher education, it is imperative to understand the types of artifacts that student teachers include in their ePortfolios. Yet artifact evaluation presents and continues to present the greatest challenge for researchers (Bruneau & Bie, 2010). There are no universal standards in terms of classifying artifacts. In addition, attaching numeric scores to highly contextualised, qualitative pieces of writing is questionable as artifacts are not quantifiable in the sense that they involve a great deal of reflection, knowledge, and skill. The different types of artifacts present further challenges as they serve different purposes and carry different weights in the overall ePortfolio presentation. Indeed, some theoreticians and practitioners have written about the technical problems associated with trying to establish some sort of reliability to portfolio scoring systems (Salvia & Ysseldyke, 2007; Koretz, 2008; Delanshere & Petrosky, 1998).

In this paper, we describe our initial forays into making meaning of artifacts in student teachers' ePortfolios. We describe a pilot study wherein we attempt to develop a coding scheme to examine the types of evidence that student teachers placed in their ePortfolios, the preliminary findings and the methodological issues faced. We were specifically interested in the number and types of artifacts included in the ePortfolios and the interpretations we could make from these.

## **Method**

### ***Participants and Context of Research***

This investigation took place at the National Institute of Education (NIE). The NIE is the sole institution providing initial teacher training in Singapore. A developmental ePortfolio was designed for initial teacher education with the purposes of: (i) charting the learning and personal growth of the student teacher through his/her experiences at the NIE and developing his/her personal teaching philosophy over time; (ii) helping to bridge the theory-practice nexus and providing evidence for the theory-practice link in the student teacher's learning and classroom teaching; and (iii) providing evidence of the attainment and integration of standards and competencies in teaching.

It constitutes an electronic collection of authentic and diverse evidence of a student teacher's learning and achievement over time, on which he/she has reflected and designed for personal development, as well as for presentation to audiences for specific purposes. It is termed the 'Learning and Teaching Portfolio', to make salient the continuum in its role in charting the development of a student teacher at NIE, his/her induction as a beginning teacher and his/her eventual professional development as a skillful teacher and is to be presented in the first instance to school leaders and NIE supervisors prior to practicum.

A commercially developed ePortfolio platform, designed by Desire2Learn Inc., was partially adapted to meet the requirements of the NIE PGDE program. The participating student teachers were granted access to the platform for the entire duration of their one-year program, in the course of which, they would be provided with the relevant support and guidance on the use of the ePortfolio to chart their learning and practice of teaching.

Participants in this pilot study were 5 student teachers enrolled in the Postgraduate Diploma in Education (Junior College) track – a program for university graduates who are preparing to teach at the Junior College level. The student teachers will be hereafter referred to as (i) WP; (ii) SE; (iii) WZ; (iv) GM; and (v) JH.

## Analysis of Data

We began by specifying what we considered an artifact. Our working definition of 'artifacts' was 'an item purposefully placed in a portfolio' (Wilton, 2004). This definition was deliberately broad so as to encompass any form of content placed in the ePortfolio by the student teacher, whether image, prose text or video.

Next, we counted the number of artifacts in each ePortfolio and classified the artifacts according to three levels following Bruneau and Bie (2010): (i) knowledge-level artifacts; (ii) skills-level artifacts; and (iii) application-level artifacts. While Bruneau and Bie (2010) did not explicitly define the three categories, we conceptualized knowledge-level artifacts as those exemplifying the knowledge and theoretical content of teaching and learning; skills-level artifacts as the artifacts focused on the practice of teaching; and application-level artifacts that specifically demonstrate the connection between theory and practice, that is they show how the theories of teaching and learning can be applied in the classroom.

Some of the artifacts fell under more than one category. In these instances, they were double-coded. For example, a lesson plan (an application-level artifact) that included concept maps (a skill-level artifact) was scored as both 'application-level' and 'skill-level'. Some artifacts found in the student teachers' ePortfolios, such as reflections and teaching philosophy, did not fall into any one of the above categories as we defined them, so we created two separate categories – 'reflection' and 'teaching philosophy', and another category labeled as 'other' for artifacts which did not fit into any of the preceding categories. Artifacts in the 'other' category included things like the teacher's curriculum vitae or photo. We had six categories in total.

## Results

A count of the number of artifacts embedded in each ePortfolio showed that there was a wide range in the number of artifacts uploaded by each student teacher (refer to Table 1). The number of artifacts ranged from 16 to 130.

WP	SE	WZ	GM	JH
16	47	41	32	130

*Table 1: Number of artifacts uploaded by the five student teachers*

All the artifacts in the student teachers' ePortfolios were then classified into the 6 categories of knowledge, skill and application-level artifacts, teaching philosophy, reflections and other. Where relevant, some artifacts were double-coded when they covered more than one category in a single piece of artifact. The number of artifacts produced by each student teacher under each category was then computed by number and by percentage. The results are reflected in Table 2 and 3 respectively.

Table 2 includes the total score obtained by each student teacher after computing all the total number of artifacts including those that were double-scored. Table 3 includes the total score in percentages for each student teacher and the percentage of artifacts belonging to more than one category.

Name of student teacher (Total no of artifacts)	Knowledge-level artifacts	Skill-level artifacts	Application-level artifacts	Teaching Philosophy	Reflections	Other	Total score
WP (16)	6	2	3	2	3	1	17
SE (47)	5	8	22	2	6	8	51
WZ (41)	4	9	14	2	4	11	44
GM (32)	5	9	11	4	8	4	41
JH (130)	40	17	82	2	33	4	178
<b>Total (266)</b>	<b>60</b>	<b>45</b>	<b>132</b>	<b>12</b>	<b>54</b>	<b>28</b>	<b>331</b>

Table 2: Classification of artifacts in the 5 pilot ePortfolios (by number)

As shown in Table 2, there were the most number of application-level artifacts (132 out of 331), followed by knowledge level artifacts (60 out of 331), reflections (54 out of 331), skill-level artifacts (45 out of 331), other artifacts (28 out of 331) and teaching philosophies (12 out of 331).

Name of student teacher (Total no of artifacts)	Knowledge-level artifacts	Skill-level artifacts	Application-level artifacts	Teaching Philosophy	Reflection	Other	Total score	% that belong to more than 1 category
WP (16)	35%	12%	18%	12%	18%	6%	106%	6%
GM (32)	16%	28%	34%	13%	25%	13%	128%	28%
WZ (41)	10%	22%	34%	5%	10%	27%	107%	7%
SE (47)	11%	17%	47%	4%	13%	17%	109%	9%
JH (130)	31%	13%	63%	2%	25%	3%	137%	37%

Table 3: Classification of artifacts in the 5 pilot ePortfolios (by percentage)

From Table 3, we can see that the student teacher, JH, uploaded the largest number of artifacts – 130, and had highest overlapping score of 37%. This was followed by SE who uploaded 47 artifacts and obtained an overlapping score of 9%. WZ uploaded 41 artifacts and obtained an overlapping score of 7% while WP who uploaded the least number of artifacts – 16, obtained the least overlapping score of 6%. GM was an exception. He uploaded 32 artifacts but obtained an overlapping score of 28%.

## Discussion

Our findings regarding the kinds of artifacts uploaded showed that the application-level artifacts were the largest category in our sample. 132 out of 331 artifacts were application-typed taking up 39.9% of artifacts. This was followed by Knowledge-level artifacts (18.13%), Reflections (16.31%) and then Skills-level artifacts (13.6%), with a relatively smaller number teaching philosophies and other artifacts.

Due to the emphasis of theory-practice links in teacher education at NIE, and the fact that student teachers had to showcase their teaching and learning to school leaders and NIE supervisors via the ePortfolio before embarking on their practicum, we expected the ePortfolio construction in our context to be very application-focused. This was evidenced by a larger portion of artifacts at the application level.

Meanwhile, the richness of artifacts was seen by the percentage of overlap between categories. We found that the ePortfolio with the fewest artifacts also had a lower percentage of overlaps, while the ePortfolio that had the most artifacts had a high percentage of artifacts that overlapped categories. This suggests that in general, student teachers who uploaded more artifacts also uploaded artifacts of richer quality, which would not fit under one category alone (high quantity; high quality). In fact, the overall pattern was that the number of artifacts uploaded tended to correlate strongly with the amount of overlapping of categories. A Pearson's correlation of 0.75 indicates a strong positive correlation between number of artifacts uploaded and the richness of those artifacts (as determined by amount of overlapping). We need to note that this analysis (not statistically significant) was only exploratory as the sample size is clearly too small. Although the correlation may not be meaningful in this instance, it does suggest an interesting avenue for future research. A larger sample size is needed to verify this finding. There is however one outlier - GM, who exhibited a high level of overlapping (28%) though he uploaded only 32 artifacts. This may be an exception, a high quality ePortfolio with relatively fewer artifacts uploaded (low quantity; high quality).

## Remaining Questions and Methodological Issues

The student teachers' background and their profiles could be a factor affecting the quantity and quality of artifacts created. High achieving and low achieving student teachers could produce ePortfolios of different quality. Moreover, student teachers' perceptions and use of the ePortfolio as a generic archiving tool versus that of using ePortfolios for selective purposes would play a part in the quantity and quality of artifacts uploaded.

The different permission-levels granted by the student teachers to their artifacts would impact upon the artifacts that we had access to. This raises the question of how should we as researchers seek to make meaning of the student teachers' ePortfolios? Should we only analyse items specifically shared which may only be those of high quality or seek to view and analyse everything in the ePortfolio which includes all the good and the bad?

## Conclusion

Clearly because of the small sample size, the findings in this preliminary study are skewed by the outlying cases. Further research is necessary to corroborate the findings. In addition, this methodological approach towards classifying and interpreting artifacts needs to be tested in future research in order to test the transferability and workability of the framework.

A number of difficult questions have been raised to which we have no clear resolutions. Added undertakings in this area are necessary to advance the understanding of the field.

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