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# Student Teachers' Motivation and Perceptions of E-Portfolio in the Context of Problem-Based Learning

Stefanie Y. Chye · Albert K. Liau · Woon Chia Liu

**Abstract** E-portfolios are increasingly seen as a promising tool for facilitating learning as students engage in the Problem-Based Learning (PBL) process. Research that evaluates e-portfolios in the context of PBL is, however, limited. In addition, advantages of the use of e-portfolios both generally as well as in the context of PBL have tended to be advanced from the researcher's perspective. Studies that have evaluated student perceptions remain unclear with regard to the factors beyond specific features of the e-portfolio which are likely to affect the perceptions. The purpose of this study is to address these gaps from the perspective of self-determination theory (SDT). It seeks to examine how student teachers' motivational profile and their experiences of value, enjoyment, and effort are related to their perceptions of the e-portfolio in a PBL environment. Participants in this study were 413 students teachers enrolled in the Diploma in Education programme at the National Institute of Education, Singapore. Results were consistent with SDT and suggest that students with more self-determined forms of motivation and who reported enjoying, valuing, and putting effort into the process were more likely to view e-portfolios in PBL in a positive light.

**Keywords** Problem-Based Learning · E-portfolio · Self-determination theory · Motivation e-portfolios in PBL

## Introduction

The recent years have witnessed an increased interest in the use of portfolios for teaching and learning. A portfolio is a collection of documents relating to a learner's progress, development, and achievements. The term electronic or e-portfolio indicates that the evidence is collected digitally (Beetham 2005). The digitised collection of artifacts can comprise of text-based, graphic, or multimedia elements archived on a website, on the world-wide web, or on other electronic media such as a CD-ROM or DVDs (Kovalchick et al. 1998; Lorenzon and Ittelson 2005). E-portfolios go beyond serving as a collection. They can serve administrative purposes like managing and organizing work created with different applications, controlling access to the work and to the linked discussion forums (Lorenzon and Ittelson 2005).

E-portfolios are generally classified into three broad categories on the basis of their purpose: (i) assessment or accountability portfolios which serve summative assessment and accreditation purposes; (ii) showcase or marketing portfolios for the presentation of one's achievements and competencies to prospective employers, and (iii) developmental or learning portfolios which facilitate student teachers' reflective learning practices through formative assessment by their tutors and/or peers (Barrett and Carney 2005; Butler 2006; Granberg 2010; Zeichner and Wray 2001). In reality, e-portfolios are oftentimes a blend of two or more of these genres depending on the needs and pedagogical designs of their institutions (Granberg 2010).

E-portfolios afford many advantages as compared to the more traditional paper-based versions. Individuals who construct and use e-portfolios are afforded opportunities to apply their knowledge of technology and to develop ICT skills (Kariuki et al. 2001; van Wesel and Prop 2008a). Digital and web-based formats allow for the presentation of teaching, learning and reflective artifacts in a variety of formats including audio, video, graphics, and texts (Constantino and De Lorenzo 2002). These make updating,

S. Y. Chye (✉) · A. K. Liau · W. C. Liu
National Institute of Education, Nanyang Technological University, Singapore, Singapore
e-mail: stefanie.chye@nie.edu.sg

transporting, storing, cross-referencing, and sharing of the portfolio easier (Bartlett and Sherry 2004; van Wesel and Prop 2008a; Yost, Brzycki and Onyett 2002). As students use technology to create graphics and link artifacts, they are better able to see interconnections and have a sense of their development (Norton-Meier 2003). Benefits are further derived from the exchange of ideas and feedback between the author of the e-portfolio and those who view and interact with it. The author's personal reflection on the work inside an e-portfolio helps to create a meaningful learning experience (Greenberg 2004).

Research comparing traditional paper-based portfolios to e-portfolios is still growing with much of e-portfolio research focusing on evaluating features of the e-portfolio per se (van Wesel and Prop 2008a). A few studies have sought to compare the effects of using paper-based versus e-portfolios on student learning outcomes. Although investigations by van Wesel and Prop (2008a) revealed no differences in students' perceptions of learning outcomes between the two, other studies have provided evidence which largely indicate positive outcomes arising from the use of e-portfolios (e.g., Bartlett and Sherry 2004) even when compared to their traditional counterparts (e.g., Driessen et al. 2007). Driessen et al. (2007), for instance, found e-portfolios to enhance students' motivation, to be more user friendly for mentors and to deliver the same quality of content as traditional portfolios.

Concomitant with the increased use of e-portfolios is the recognition of the potential utility and value of integrating it into the pedagogical approach of Problem-Based Learning (PBL).

## E-Portfolios in Problem-Based Learning (PBL)

PBL is a learner-centered strategy that is organized around a real-world, unstructured problem. During PBL, students work in teams to analyze and solve the problem; constructing and co-constructing their knowledge through collaborative inquiry, self-directed learning, and peer learning. The PBL process ends with student teams presenting their solutions and reflecting upon and evaluating their learning process. Teachers act as a guide and a facilitator throughout the PBL process, scaffolding students' inquiry processes as they work. In PBL, both the processes and products of learning are equally valued (e.g., Tan 2003).

Interest in integrating e-portfolios into PBL stems from several reasons pertaining to their perceived compatibility. It is held that e-portfolios hold considerable promise in helping to facilitate learning as learners engage in the PBL process and are more appropriate to assessing the goals of PBL than traditional assessment strategies (e.g., Frank and Barzilai 2004; Liu et al. 2009a). E-portfolios are recognized as a useful tool that can be used to support the process of learning both generally (Beetham 2005) as well as

in PBL (Liu et al. 2009a). Because portfolios enable students to document their work and their reflections at different points in time throughout the project, their progress, and their goals, opportunities arise for tutors to use this information to support the learning process. The information can further be used to identify students that may need extra support or more challenging activities and acts as a formative assessment and monitoring tool to keep track of how learners are performing during learning (e.g., Ahn 2004; Barrett 2002; Beetham 2005). In addition, e-portfolios have the potential to provide a structure for learning, encouraging reflection, facilitating collaboration, and provides for the documentation of students' progress and goals (Liu et al. 2009a). As such, they can be an important part of the PBL cycle.

Nevertheless, beyond theorizing about the possibilities and potentialities of e-portfolios for PBL, empirical evidence and research in this area has been found wanting. In one of the few related studies, Oberski et al. (2004) sought to ascertain the attitudes of nursing students engaged in a PBL module and who were assessed through practice portfolios. Oberski and colleagues found that while the majority expressed some positive views, the combined use of PBL and practice portfolios proved to be too demanding for the students most of whom had no prior experience of either. The authors concluded that the combination could be very valuable, but would only be more feasible once the two have become more integrated into the nursing curricula and with more supports in place.

In a preliminary evaluation of the student teachers' experiences with the e-portfolio involving both quantitative and qualitative data, Liu et al. (2009a) found that the student teachers viewed the e-portfolio positively in terms of whether it facilitated the development of important PBL-related skills, provided a structure for guiding and documenting learning during the PBL process, its ease of use and its facilitation of a learner-centered approach that allowed student teachers to construct their own knowledge.

Taken together, empirical research has thrown up inconsistent conclusions with regard to how students perceive the efficacy of e-portfolios in PBL. Advantages of the use of e-portfolios both generally as well as in the context of PBL have tended to be advanced from the researcher's theoretical perspective. Less attention has been accorded to users' or students' perceptions of the efficacy of e-portfolios in supporting their learning in PBL. Yet, student perceptions form an important part of this evaluation (e.g., Lam and McNaught 2004; Tosh et al. 2005). van Wesel and Prop (2008a, b) drawing on similar arguments by other researchers assert that, "[t]he student perspective is relevant, since the student perception of a learning environment in a large extent affects and is affected by the way students manage to work with the environment, and thus

influences their learning." This argument becomes more compelling in view of empirical evidence which suggests that student attitudes toward the use of e-portfolios in PBL are not as forthcoming as theorized by researchers and suggest that more research is warranted.

Another important question pertains to the factors that could potentially affect student perceptions of e-portfolio use and hence explain the disparity. Researchers have examined the technicalities of using the e-portfolio, and the technical features of e-portfolio itself (e.g., van Wesel and Prop 2008b). However, few if any studies have examined how characteristics of learners themselves may affect how the integration and use of e-portfolios in PBL is viewed by students. Students' motivation is relevant since it potentially affects the way students work with and view the e-portfolio. Motivation provides a basis for predicting what factors will promote versus negate students' perceptions of the effectiveness of the e-portfolio in supporting PBL and is important to understanding why and how students engage with and evaluate e-portfolio use in the context of PBL.

While Liu et al. (2009a) examined student teachers' perceptions of the e-portfolio in a PBL context, motivational factors were not accounted for. The present research extends the earlier work of these researchers to examine the role of motivational profiles and levels of affective engagement in influencing student teachers' perceptions of e-portfolios in a PBL context.

## Student Motivation and Perceptions of E-Portfolio in a PBL Context

Student motivation is a key prerequisite for effective learning from e-portfolios (Al Kahtani 1999; Tosh et al. 2005). The lack of sufficient motivation makes e-portfolio work a chore and diminishes its learning benefits (Tuksinvarajan and Todd 2009).

Self-determination theory (SDT) as developed by the researchers Deci and Ryan (e.g., Deci and Ryan 1985) offers great promise in helping to advance understanding of students' motivation in pedagogies that require collaboration (Liu et al. 2009b) such as PBL. According to SDT, the

type or quality of a person's motivation is important in predicting important outcomes (Deci and Ryan 2008).

Deci and Ryan (e.g., Deci and Ryan 2000) proposed the existence of different types of motivation, each of which reflects different levels of self-determination. Amotivation pertains to the relative absence of motivation and is neither intrinsic nor extrinsic in nature. External regulation, the least self-determined form of extrinsic motivation, refers to behavior that is controlled by external means, such as rewards or external authority. Introjected regulation refers to behavior that is internally controlled or self-imposed, such as acting out of guilt avoidance or ego-enhancements. Identified regulation, a more self-determined form of extrinsic motivation, refers to acting according to one's choices or values. Integrated regulation is the most self-determined form of extrinsically motivated behavior and is behavior undertaken on the basis of one's choice or values. It is characterized by feelings of "want to" rather than "ought to." Finally, intrinsic motivation reflects the highest degree of self-determination and refers to behavior that emanates fully from the self and is undertaken solely for its own sake or enjoyment. The preceding types of motivation can be viewed as a continuum ranging from the impersonal, to the highly external, to the highly internal, and from the non-self-determined to the most self-determined. Figure 1 represents the self-determination continuum diagrammatically.

Vallerand (1997) further developed the work of Deci and Ryan and proposed that the different motivational profiles leads to different types of cognitive, affective, and behavioral outcomes for the individual. In addition, Vallerand proposes that the quality of consequences decreases as a function of the type of motivation with intrinsic motivation having the most positive consequences, followed by integrated and identified regulation. On the other hand, introjected but especially external regulation and amotivation tends to be associated with negative consequences. This is to say that positive outcomes should result from self-determined forms of motivation (intrinsic motivation, and identified regulation), whereas negative outcomes should result from less self-determined forms of motivation (especially amotivation and external regulation).

Support for this prediction has been found in varying contexts including work, interpersonal relationships, education,

**Fig. 1** The self-determination Continuum (Deci and Ryan 2000)
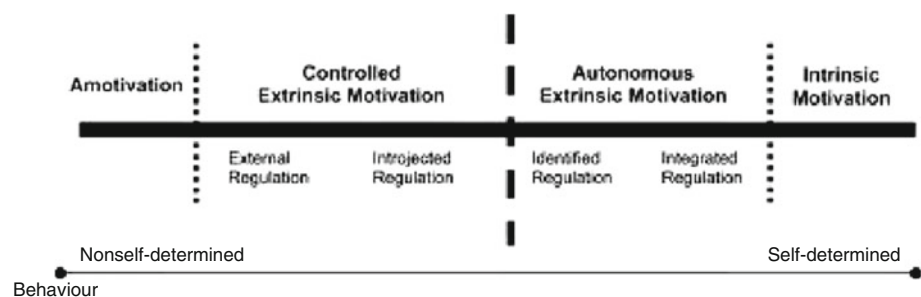
and sport (Vallerand 1997). In the field of education, research has demonstrated that more self-determined extrinsic motivation was associated with better performance, higher quality learning, engagement, conceptual learning, and/or enjoyment of academic work and school as well as more positive coping (e.g., Grolnick and Ryan 1987; Grolnick et al. 1991; Miserandino 1996; Ryan and Connell 1989; Vallerand et al. 1993) while less self-determined motivation was found to be unrelated or negatively related to these outcomes (e.g., Vallerand et al. 1993) as well as related to anxiety and maladaptive behavior (e.g., Ryan and Connell 1989). More self-determined motivation was also related to the affective outcomes of value, effort, and enjoyment (e.g., Vallerand 1997).

Apart from the motivational profiles, SDT also postulates that students' subjective experiences in a particular activity as measured by value, effort, and enjoyment would provide indications of learning outcomes.

Applied to the context of the present study, student teachers' self-determined motivation potentially affects the way they learn and work with the e-portfolio as well as how they perceive it. Student teachers' self-determined motivation provides a basis for predicting the quality of engagement as well as their perceptions of the effectiveness of the e-portfolio in a PBL context. We conceptualize and operationalize the expected outcomes in terms of perceptions of the effectiveness of e-portfolios and focus on affective consequences as indicated by the extent of value, effort and enjoyment derived from engaging in PBL. Student teachers who are intrinsically motivated, and who exemplify integrated and identified regulation are more likely to view the use of e-portfolios in a positive light and are more likely to report value, effort, and enjoyment in the whole process. Conversely, student teachers who report introjected and particularly external regulation and amotivation are more likely to perceive e-portfolio negatively and to report less value, effort, and enjoyment.

## Objectives of the Present Study

The objective of this study is thus to examine how student teachers' motivational profile is related to their perceptions of the e-portfolio in a PBL environment as well as the value placed on, their enjoyment and effort channeled into the process.

## Method

### Participants

The present study was conducted at the National Institute of Education (NIE) the sole institution providing initial

teaching training in Singapore. Participants in this study were 413 student teachers from 17 tutorial groups enrolled in pre-service teacher education at the Diploma level. A core educational psychology module that employed PBL was examined. 72.2 % of the participants were female while 25.5 % were male. The remaining 2.3 % did not report their gender.

### Context of the Present Study

The PBL module of interest is situated within a core educational psychology module. In the PBL component of the module, student teachers explore how students learn or fail to learn, and apply psychologic principles and learning theories to explain how and why using the PBL approach. The PBL model adopted follows that of Tan (2003) and is diagrammatically represented in Fig. 2. The whole PBL process involves 5 weekly face-to-face tutorial sessions, each lasting 2 h, and corresponds to the five stages of Tan's (2003) PBL process (i) meeting the problem; (ii) problem analysis and learning issues; (iii) discovery and reporting; (iv) solution presentation and reflection; and (v) overview, integration, and evaluation. Tutors facilitate each of these face-to-face tutorials. Both in and out of class, student teachers engage in self-directed learning and independently research into the problems.

The design and structure of the e-portfolio that were employed in this module is described in detail elsewhere (see Liu et al. 2009a). But, generally, the e-portfolio was a
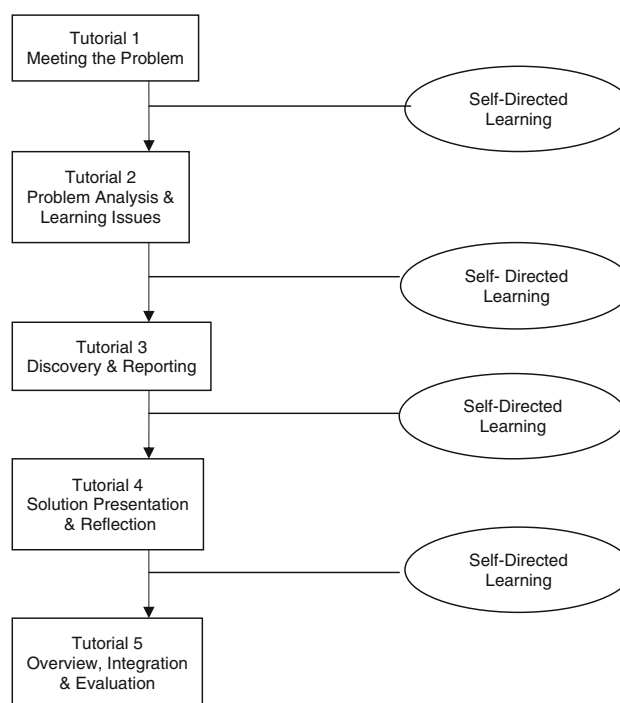
**Fig. 2** The PBL process

hyperlinked portfolio by the Microsoft Office application PowerPoint and sought to scaffold student teachers' learning and inquiry processes during each stage of the PBL. The e-portfolio was designed specifically to scaffold knowledge construction, document learning, and facilitate idea sharing, as well as to guide students through the PBL process by informing them of the learning objectives at each stage, their tasks, and the expected deliverables. The e-portfolio also facilitated the PBL process by making students record their plans and actions, as well as offered scope for reflection and evaluation. Because the PBL e-portfolio was designed to be a scaffold, students were given the autonomy to modify and adapt it to their own learning journey. The e-portfolio in our context served both formative and summative functions.

## Procedure

Student teachers' motivational profiles as well as indications of value, effort, and enjoyment were assessed by means of a pre-survey before the start of PBL. At the end of PBL, student teachers' motivational profiles, enjoyment, value, effort, and perceptions of the e-portfolio were examined by means of a post-survey.

## Measures

Consistent with the work of SDT researchers, student teachers' motivational profiles were assessed by the Perceived Locus of Causality Scale (PLOC)[1] (Goudas et al. 1994), while their enjoyment, value, and effort were assessed via the Intrinsic Motivation Inventory (IMI) (McAuley et al. 1989). Student teachers' perceptions of e-portfolio were assessed via the perceptions of the e-portfolio scale developed by Liu et al. (2009a) which measured student teachers' perceptions of the e-portfolio's usability, support of generic learning, scaffolding, and documentation. All measures employed a 5-point Likert scale ranging from 1 (not at all true) to 5 (very true).

### Perceived Locus of Causality Scale (PLOC)

The PLOC scale (Goudas et al. 1994) was employed to determine student teachers' motivational profile—amotivation, external, introjected, identified, and intrinsic motivation. There were 17 questions in this segment. Student teachers were asked for reasons they completed the tasks

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[1] Integrated regulation was not measured in this study in view of research (e.g., Hagger et al. 2002; Standage et al. 2005; Wang et al. 2009) that have found extremely high correlations between identified and intrinsic motivation and called into question the discriminant validity of these two components of the PLOC, thus subsequently leading to the exclusion of identified motivation in these studies.

during PBL. Response choices included but are not limited to "because I will get into trouble if I don't"; "because I want to learn new skills"; "because I want others to think that I am good." Cronbach α's for amotivation, external regulation, introjection, identification, and intrinsic motivation were .64, .63, .71, .71, and .80, respectively, for the present sample (refer also to Table 1).

### Intrinsic Motivation Inventory (IMI)

The IMI scale (McAuley et al. 1989) assessed student teachers' enjoyment, value, and effort during PBL. Items include but are not limited to, "I thought the lessons are quite enjoyable," "I believe the lessons could be of some value to me", and "I try very hard in the lessons." There were 18 questions in this segment. Cronbach α's for the enjoyment, value, and effort scales were .67, .87, and, .92, respectively (refer also to Table 1).

### The Perceptions of the E-portfolio Scale

Student teachers' perceptions of e-portfolio were assessed by means of the perceptions of the e-portfolio scale developed by Liu et al. (2009a). There were 18 questions in this scale; 4 of which measured student teachers' perceptions of the e-portfolio's usability, 6 questions measured support of generic learning skills, 5 questions measured scaffolding provided, and 3 questions measured e-portfolio's perceived effectiveness in acting as a documentation tool. The Cronbach α for the overall perceived effectiveness of the e-portfolio scale was .97 (refer to Table 1). Questions included "the e-portfolio was easy to use," "the e-portfolio helped us improve our problem-solving skills," "the e-portfolio scaffolded the PBL process for us," and "the deliverables that we included in our e-portfolio documented what we did at each stage."

**Table 1** Means, standard deviations, and Cronbach α's for the main variables of the study

| Variable | Mean | SD | α |
|---|---|---|---|
| E-portfolio | 3.69 | .75 | .97 |
| Amotivation | 1.41 | .60 | .64 |
| External | 2.52 | .85 | .63 |
| Introjected | 2.79 | .81 | .71 |
| Identified | 4.11 | .65 | .71 |
| Intrinsic | 3.72 | .75 | .80 |
| Value | 3.91 | .74 | .87 |
| Enjoy | 3.60 | .76 | .67 |
| Effort | 4.15 | .57 | .92 |

## Results

The means, standard deviations, and Cronbach α's for the main variables of the study can be found in Table 1. The zero-order correlation coefficients among the main variables of the study can be found in Table 2. The amotivation subscale was negatively related to perceptions regarding the e-portfolio scale. The external and introjected subscales were not related to perceptions regarding the e-portfolio scale. The rest of the motivation subscales were positively related to perceptions regarding the e-portfolio scale.

In order to examine the multivariate relationships between the motivation subscales and perceptions regarding the e-portfolio, two sets of multiple regression analyses were run with perceptions regarding the e-portfolio scale as the outcome variable. The first set of regression analyses involved the extrinsic–intrinsic motivation subscales as predictors controlling for the pre-PBL levels of the respective motivation subscales. The second set of regression analyses involved the enjoy, effort, value subscales, controlling for the pre-PBL levels of the respective motivation subscales. With regards to the extrinsic–intrinsic motivation subscales, the regression analyses indicated that in the multivariate analyses, the amotivation and external motivation subscales were negatively related to perceptions regarding the e-portfolio, and the intrinsic

subscale was positively related to perceptions regarding the e-portfolio. With regards to the enjoyment, value, and effort subscales in the multivariate analyses, all three subscales were positively related to perceptions regarding the e-portfolio. Refer to Table 3.

## Discussion

Our findings provide some support for SDT and suggest that SDT may be a useful framework to understand motivation and outcomes related to the use of e-portfolio in the context of PBL. Results support Vallerand's (1997) proposal that positive outcomes should result from more self-determined forms of motivation (intrinsic motivation and identified regulation), whereas negative outcomes should result from less self-determined forms of motivation (especially, amotivation and external regulation). More specifically, our findings showed that effort, enjoyment, and value are affective outcomes and consequences associated with different motivational types. Student teachers with more self-determined motivational profiles were more likely to report effort, enjoyment, and value as compared to less self-determined student teachers during the process of PBL.

**Table 2** Zero-order correlations among the main variables in the study

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. E-portfolio | – | | | | | | | |
| 2. Amotivation | −.31** | – | | | | | | |
| 3. External | −.04 | .26** | – | | | | | |
| 4. Introjected | .03 | .14** | .61** | – | | | | |
| 5. Identified | .28** | −.31** | .05 | .26** | – | | | |
| 6. Intrinsic | .38** | −.35** | −.03 | .10* | .60** | – | | |
| 7. Enjoy | .50** | −.47** | −.13** | .03 | .39** | .66** | – | |
| 8. Effort | .27** | −.18** | .09 | .20** | .45** | .31** | .42** | – |
| 9. Value | .48** | −.46** | −.06 | .07 | .48** | .62** | .76** | .40** |

N = 413

** p < .01; * p < .05

**Table 3** Multiple regression analyses with perceptions regarding the e-portfolio as the outcome variable

| | B (SE) | t |
|---|---|---|
| Regression involving extrinsic–intrinsic motivation subscales, controlling for pre-PBL levels of the motivation subscales | | |
| Amotivation | −.40 (.06) | −6.59** |
| External | −.10 (.05) | −1.98* |
| Introjected | .01 (.05) | .10 |
| Identified | .32 (.06) | .33 |
| Intrinsic | .34 (.05) | 6.71** |
| Regression involving the enjoy/effort/value motivation subscales, controlling for pre-PBL levels of the enjoy/effort/value motivation subscales | | |
| Enjoy | .49 (.05) | 10.40** |
| Effort | .27 (.07) | 4.00** |
| Value | .46 (.05) | 9.38** |

** p < .01; * p < .05

In addition, amotivated student teachers were more likely to perceive the e-portfolio negatively which is consistent with previous studies, whereby amotivation was related to negative outcomes (e.g., Pelletier et al. 1995). The external and introjected subscales were not related to perceptions regarding the e-portfolio scale. Again, this is consistent with previous work (e.g., Vallerand et al. 1993) conducted in the context of education which found external regulation to be negatively related to or unrelated to outcomes and that when relationships were established, these relationships were only moderate to small (Ntoumanis 2001). Our results also support previous studies by Vallerand et al. (1993) as well as Pelletier et al. (1995) which found introjected motivation to be unrelated to most positive and negative outcomes. On the other hand, student teachers with identified and intrinsic motivation were more likely to view the e-portfolio positively as hypothesized by Vallerand (1997).

The subscales of enjoyment, value, and effort were positively related to perceptions of e-portfolio and indicate that student teachers who enjoyed PBL, valued the PBL process, and put effort into the PBL project were more likely to have positive perceptions of the e-portfolio.

### Implications for Educational Practice

Our findings suggest that an understanding of student teachers' motivational profiles may provide insights into how these individuals perceive and ultimately engage with the e-portfolio in PBL. In addition, it suggests that teacher educators who are planning to implement e-portfolios in PBL may want to enhance student teachers' motivational profiles and move them toward more self-determined forms of motivation both before and as they engage in PBL.

SDT provides a number of suggestions as to how this can be achieved. To enhance student teachers' self-determined motivation, SDT suggests that fostering perceptions of autonomy, competence, and relatedness are necessary. Autonomy refers to a sense of choice and control over one's behavior. Competence refers to the ability to achieve desired outcomes while relatedness refers to a sense of acceptance by others. Teacher educators need to consider how to fulfill these needs both before and as students use the e-portfolio in PBL.

Teacher educators could think about how to support student teachers' need for autonomy as they use the e-portfolio. This could be achieved by providing opportunities to exercise choice and initiative where this allows. Yet, this is by no means a simple task as teacher educators need to negotiate and tread the tight rope of giving students a free-hand and hence risk their feeling lost and being thrown in the deep end, and providing too much scaffolding at the expense of autonomy.

Student teachers' perceptions of competence could be enhanced by providing adequate support, training, and encouragement as they embark on the use of e-portfolios. This is especially important in view of Oberski et al. (2004) findings that the combination of e-portfolios with PBL is particularly demanding.

Teacher educators also need to consider how to fulfill the need for relatedness as student teachers work on the e-portfolio. Because ours is a hyperlinked powerpoint template that student teachers engage in together during the face-to-face sessions in PBL, it does not allow for complete online collaboration. As such, the perceptions of relatedness may not be as diminished as fully electronic platforms which students can navigate and work with online without face-to-face sessions. Hence, teacher educators can harness the opportunities provided by the face-to-face PBL tutorials to connect with their charges.

### Implications for Future Research

Clearly, this is a preliminary study and further research is needed to support our findings. In particular, future studies could consider better ways of separating the effects of e-portfolios from PBL, and of possibly using more sophisticated statistical techniques such as structural equation modeling which has been suggested to be effective in teasing out the effects of students' motivational profiles and outcomes variables when employing SDT (Ntoumanis 2001). Furthermore, the present study focused only on student teachers' perceptions of e-portfolios as outcome variables. Future work could extend this by examining student teachers' actual performance in the e-portfolios, as indicated by summative markings of the e-portfolio, as another outcome in the study.

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