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E-PORTFOLIOS @ TEACHER TRAINING: AN EVALUATION OF TECHNOLOGICAL AND MOTIVATIONAL FACTORS

Alfred Klampfer, Mag. Dr.[1] and Thomas Köhler, Prof. Dr.[2]
[1]*Private University College of Education Linz, Salesianumweg 3, A – 4020 Linz*
[2]*Technical University Dresden, Weberplatz 3, D – 01217 Dresden*

ABSTRACT

In recent years e-portfolios have received a great deal of attention in the educational discourse and it is associated with individualization of the learning process, competence-oriented assessment and institutional personnel development.
Since the beginning of the academic year 2008/09 students of the Catholic College of Education Linz had the opportunity to create and write their own e-portfolio in the context of the teacher training. Here the e-portfolio serves as an instrument for professional development in teaching by reflecting one's own learning process and by illustrating the way of competence development as well as an instrument for professional feedback.
The objective of this research is to evaluate motivational and technological factors towards using e-portfolios among students. Furthermore e-portfolios shall be developed as a tool and a method in teacher education. Authors will address the following research questions:

- How is the e-portfolio assessed by students (attitudes, benefits, relevance, usability, motivation, acceptance, etc.)?
- What factors do acceptance and motivation towards working with e-portfolios depend upon?
- Does the frequency of feedback influence acceptance and motivation?

Theoretical basis for the research is an adapted version of *model of motivation and acceptance with technology* for working with e-portfolios by students in teacher training. It will be validated and adapted through an empirical-quantitative study based on hypothetical principles. In a second step, the resulting model is undergoing a partial least square (PLS) calculation – an analysis in order to estimate and interpret interrelations and causal effects and to optimize the model of our research.

KEYWORDS

E-Learning, E-Portfolios, Motivation, PLS, Technology Acceptance, Teacher Training, Usability

1. INTRODUCTION

With the Bologna-compliant revision of curricula at colleges and universities and the orientation of the studies towards studentical competences or „learner centred approach(es)" (i.e. outcome instead of input orientation) more and more e-portfolios have found their way into the curricula of various training and continuing education courses. They are associated with individualization of the learning process, self-organized learning, reflection of the learning process, but competency based assessment discussed with institutional staff development.

Barbara Cambridge, former Vice President of the American Association for Higher Education indicated already in 2005 in her presentation at the „e-Portfolio Forum Austria"F[1]F that:

> „Learners in the 21st Century, who are able to describe, apply and evaluate their knowledge and skills, will progress in their role as individuals, citizens and will perform better at work. E-Portfolios are a way of supporting learners through reflection, integration, development, self-management, lifelong learning and social development."

In many areas of the teaching / learning process is not enough to identify and grade results selectively. In the specific case of school practical studies within teacher education only an individual learning process

[1] http://eportfolio.salzburgresearch.at/index.php?option=com_content&task=view&id=13&Itemid=41&lang=deH [1.7.2010]

allows acquiring „professional" teaching behaviour by making the individual performance visible. Unlike traditional forms of testing, such as tests, exams or essays, assessment methods enable focussing on problem solving strategies and processes as well as a greater insight into the underlying skills of prospective teachers.

A portfolio in general and an e-portfolio in particular can be valuable tools for presenting, discussing and questioning developmental processes. At the Private University College of Education Linz e-portfolios have been used for four years in the practical school studies with internal tests and external reports based upon the e-portfolio management system „Mahara" (cp. Himpsl & Baumgartner 2009). Through a comprehensive care plan students but also teachers receive maximum support when working with e-portfolios. Even though e-portfolios are not assessed per se they are an essential component in teacher training to represent the students' growth of competence during the practical training of teaching.

During practical training of teaching (that takes place at selected schools) students are accompanied by the practice teacher inside the respective schools as well as by the docents from the College of Education. Practice teachers observe every teaching activity of the students and discuss it with them on the very same day. In addition, students can join the lectures of their practice teachers. Docents from the College of Education observe the students' teaching activity about two to three times a semester. They serve mainly as didactic and methodological experts and assist students for professionalizing their teaching skills. Through feedback from the practice teacher and the peers the students' teaching should be questioned and developed continuously.

Within that setting the e-portfolio serves the individual documentation of the students' learning process. To use e-portfolios throughout the complete teacher training process students must be highly motivated. Yet it is not clear how motivation as a condition of acceptance behaviour and attitudes is functioning specifically. For a successful and sustainable implementation of the e-portfolios it also needs to be analysed how motivation as a key element of the acceptance process can be developed.

2. THEORETICAL FRAME

2.1 Definition of „E-Portfolio"

For an appropriate definition of e-portfolios we can find in the literature numerous proposals along with a variety of different terms such as reflection, collection, competence and summary. Since the process of personal skills development in the practical training of teachers is an essential criteria in teacher training, the following definition of Hilzensauer and Hornung-Prähauser (2005, p.4) was taken over from Salzburg Research as a basis for this research project, who defines as e-portfolio:

> „a digital collection of 'skilfully produced work' (artefacts) of a person purporting to document the product (learning outcomes) and the process (learning path / growth) of their competence development within a certain time and for certain purposes and illustrate if the person concerned has made the selection of the artefacts itself and if it is organized in terms of the learning goal itself. As the owner this person completely controls who, when and to what extent it is allowed to view information from the portfolio."

This definition emphasizes both product-orientation and process-orientation as important aspects of the work with an e-portfolio. The key objective is therefore not collecting of artefacts but the documentation of the Learning and performance-related progress of the learner on cognitive, social and emotional level. By designing portfolio-documents over a longer period of time an increase of self-responsibility, self-control and self-assessment by increasing metacognitive (self-)reflexivity of those involved is triggered (cp. Stangl 2004).

2.2 Self-Determination Theory of Motivation (Deci & Ryan, 2000)

Motivation plays an important role in the development of a human being in general, but for learning as well as for learning with e-portfolios in particular. Two scientifically widely accepted theoretical approaches can be found which are the „Self-Determination Theory of Motivation" (SDTM) and the "Attention Relevance Confidence Satisfaction-Model" (ARCS), which partly overlap.

In the self-determination theory of motivation SDTM developed by Edward L. Deci and Richard M. Ryan (2000) is assumed that people have the innate (intrinsic) desire to explore actively and to understand the environment but also involving themselves into social structures, to make connections and expand their skills. These innate tendencies are essential to Deci and Ryan, down to three basic psychological needs, the need for autonomy, the need for competence and effectiveness as well as the need to belong, to satisfy. The fulfillment of these basic needs is a prerequisite for a healthy personality development and the basis for the intrinsic (self-) motivation:

> „The findings have led to the postulate of three innate psychological needs - competence, autonomy, and relatedness - which when satisfied yield enhanced self-motivation and mental health and when thwarted lead to diminished motivation and well-being." (Deci & Ryan, 2000a, p. 68).

The need for autonomy is more powerful than the other two requirements. Only in a self-directed and informal learning environment one can experience competence and social integration, leading to intrinsic learning. When missing one of the three factors learners will avoid this learning setting or it has a negative influence.

2.3 The ARCS – Model (Keller & Kopp, 1987)

Already in the 80's of the last century John Keller developed the ARCS model for designing instructions at school. The model provides strategies for a systematic and targeted promotion of a student's motivation. It is based upon the differentiation of four main categories of motivation: attention, relevance, confidence in success and satisfaction.

Table 1. Main categories of the ARCS-Model

Main Categories	Task of the Motivation Design
Attention	Creation and maintenance of attention and interest of the learner.
Relevance	Transferring the usefulness of the learning unit for reaching personal goals and for the satisfaction of specific needs.
Confidence	Building of a positive expectation toward success and competence opinion and perception of one's own control.
Satisfaction	Offer of attractive possibilities for action, rewards, feedback and opportunities to assess their own performance.

Based on the ARCS - model recommendations for the design of multimedia learning environments have been developed (cp. Niegemann et al., 2008, p 370).

2.4 Models of Acceptance

Securing the acceptance of the use of e-portfolios in teacher-training is essential for a successful implementation of e-portfolios.

Simon's (2001, p 87) „acceptance" means a „positive decision concerning of an innovation taken by the user" in contradiction to the concept of rejection. By innovations novel products or services are understood. Muller & Muller-Boling established (1986) the distinction between attitude and behaviour acceptance. The setting of acceptance includes an affective (motivational-emotional) and a cognitive component and is not directly measurable. With the acceptance behaviour the observable behaviour toward the innovation (e.g. use) is explored. This dichotomy is accepted in many acceptance models (e.g. technology acceptance model of Davis TAM1 1989, TAM2 of Davis and Venkatesh 2000, Dynamic Acceptance Model by Kollmann 1998, Model for the use of e-learning among teachers from Traxler (2009). Bürg and Mandl (2004, p. 5) transferred this distinction of behaviour versus attitude of acceptance into a model of acceptance of e-learning in companies and emphasize the importance of individual characteristics plus characteristics of the learning environment. For the empirical study of the acceptance of e-portfolio work, this notion of acceptance is also useful due to the common focus on the use of acceptance of IT systems.

2.5 Motivational and Technological Factors of e-portfolio Usage

Based on the self-determination theory of Deci and Ryan (2000), the ARCS-model of Keller and Kopp (1987), on the work of Bürg and Mandl (2004, 2005) and in the acceptance model for e-learning as well as a model for the integration of acceptance motivation in media-based courses by Buck (2006) we were able to derive personal factors versus contextual factors in the acceptance of working with e-portfolios. These factors were checked on motivational aspects in the sense of self-determination theory and the ARCS model. The following diagram illustrates these relationships in an extended model for motivation and acceptance of working with e-portfolios. Factors that could have influence on the motivation in the sense of self-determination theory („S") and the ARCS model („A") were characterized.

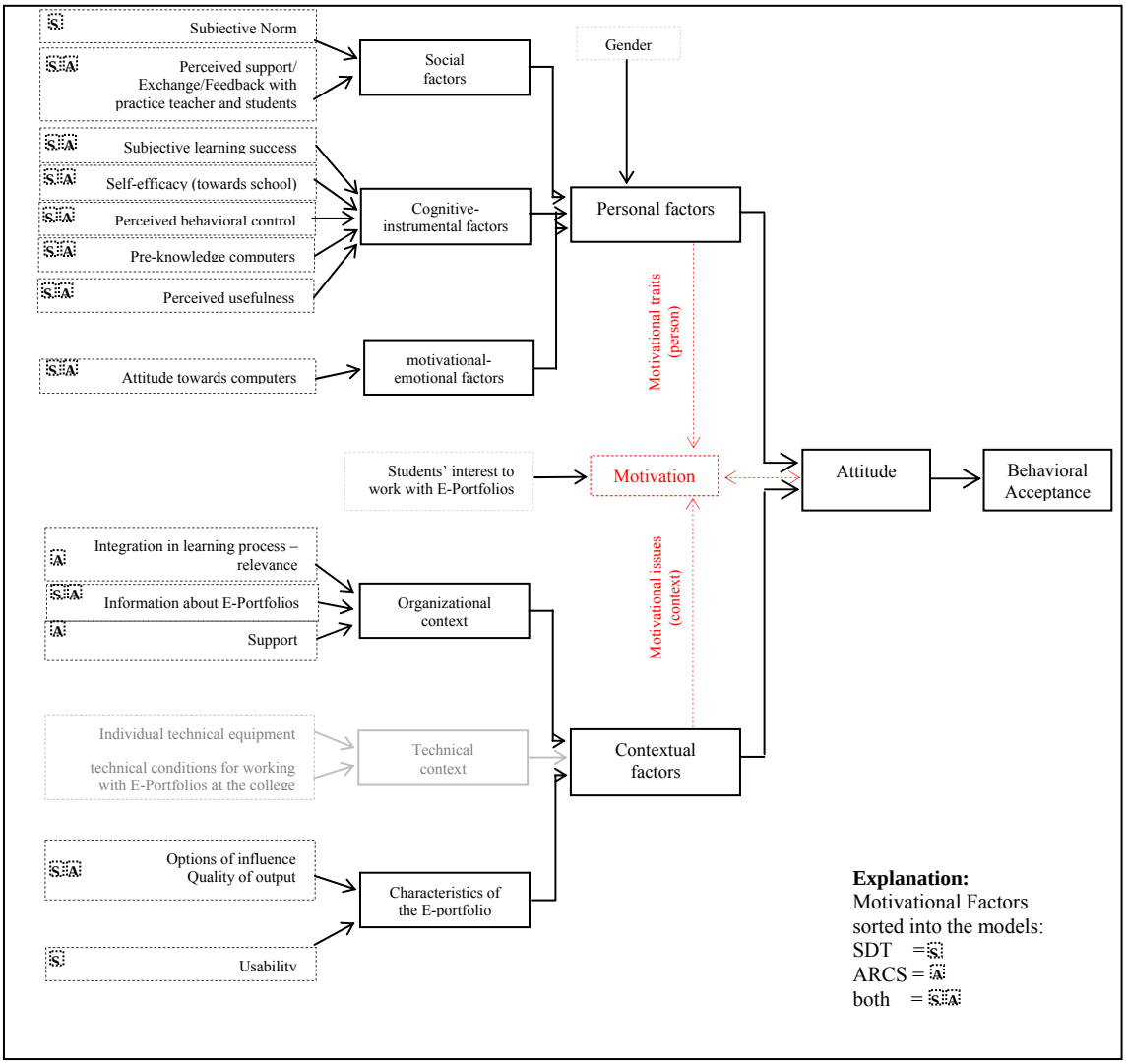

Figure 1. Model of motivation and acceptance toward working with an E-Portfolio (own figure based upon the models of Bürg & Mandl, 2004, combined with Buck, 2006)

From the model, the following research questions can be derived:

1. To what extent there is a relationship between the collected personal characteristics and the motivation toward working with e-portfolios?
2. To what extent there is a correlation between the assessment of the contextual factors and the motivation to work with e-portfolios?
3. To what extent there is a relationship between motivation and attitude?
4. To what extent there is a link between behaviour and attitudes?

3. METHOD AND RESEARCH DESIGN

To answer the research questions based on the presented „concept of acceptance and motivation of e-portfolio work" field experiment with two quantitative (written) surveys was used. Using this design the hypotheses could be tested. Below is a structural overview of the chosen research design:

Figure 2. Empirical Research Design

Two non-randomized groups were formed, one treatment group (T) and one control group (C). Members of the treatment group should have reported their personal progress, reflections, sketches, etc. continuously for the practice teacher by using the e-portfolio and also got amplified feedback from the practice teacher (at least once a month). Members of the control group could decide independently if and when they opened their e-portfolios for the respective practice teacher. Those received feedback only at the end of the semester, either orally or through a note in the e-portfolio. Both, the treatment as well as the control group were monitored by using a pre (O1) and a post (O2) test survey.

The quantitative data collection was realized as a written survey in web-based form at the beginning of the semester in October 2011 (the first survey) and at the end of the semester, conducted in February 2012 (the 2nd survey). The students received the link to the survey via e-mail and were asked to participate. Simultaneously they were informed that the survey would be completely anonymous. As instrument for the survey the professional standard software for online surveys EFS Survey (www.unipark.info) was used.

The following table provides an overview of the participants of the survey, who completed the entire questionnaire:

Table 2. Sample

Survey	female		male		total
	N_f	%	N_m	%	Σ
1 (2011/10)	54	80,60%	13	19,40%	67
2 (2012/02)	54	78,30%	15	21,70%	69
Participants in both surveys	**52**	**81,25 %**	**12**	**18,75%**	**64**

The response rate of the participants that participated in both surveys and filled in both questionnaires completely was 71%.

Based from theoretical considerations and research hypotheses for the creation of the two questionnaires validated survey instruments were adopted from the field of teaching and learning research and checked on its applicability to our research projects. The following instruments were applied:

- Questionnaire on the „*Content differentiated collection of computer-based settings*" (abbreviated FIDEC)
- and Questionnaire „*Confidence in dealing with computers and computer applications*" (COMA) of the "*Inventory of computer education*" (INCOBI-R) by Naumann, Richter and Horz (2010)[2]
- Questionnaire of „*Academic self-efficacy*" of Jerusalem and Satow (1999)[3]
- „*Intrinsic Motivation Inventory*" (IMI) von Deci und Ryan (1990)[4]
- „*Short scale for intrinsic motivation*" KIM (2009)[5]
- Items from the „*Research Report 148*" by Kopp, Balk and Mandl (2002) and
- „*Research Report 161*" by Kopp, Dvorak and Mandl (2003)[6]
- „*System Usability Scale*" (SUS) by Brooke (1986)[7]

Missing questions were derived from the theoretical considerations. In this study, a five-level rating scale with the levels -2 (strongly disagree) to +2 (strongly accurately) was used.

4. RESULTS

4.1 Correlation Studies

In a first step bi-variate correlations were calculated as presented in table 3. Obviously there is a highly significant correlation for both, personal factors as well as contextual factors, whereas personal factors contain social, cognitive-instrumental and motivational-emotional components and the contextual factors cover the organizational context plus the technical characteristics of the E-Portfolio.

Table 3. Bi-variate correlations

	Motivation r_s	Attitude r_s
Gender	,079	,128
Personal Factors	**,658****	**,553****
Social Factors	*,677***	*,574***
Subjective Norm	,659**	,591**
Perceived Support (N=45)	,539**	,494**
cognitive-instrumental factors	*,768***	*,645***
subjective learning success	,598**	,495**
School-related self-efficacy	,045	,101
Perceived Behavioural Control	,602**	,585**
Preliminary Computer Knowledge	-,049	-,034

[2] Pädagogische Psychologie, 24 (1), 2010, Hans Huber, Bern, pp 23-37.
[3] http://userpage.fu-berlin.de/~health/self/skalendoku_selbstwirksame_schulen.pdf [1.7.2012]
[4] http://selfdeterminationtheory.org/questionnaires [29.12.2012]
[5] http://www.ipn.uni-kiel.de/zfdn/pdf/15_Wilde.pdf [15.8.2012]
[6] http://epub.ub.uni-muenchen.de/273 , http://epub.ub.uni-muenchen.de/256 [12.12.2012]
[7] http://www.measuringusability.com/sus.php [29.12.2012]

Perceived usefulness	,730**	,573**
motivational-emotional Factors		
Attitude towards Computers	,159	,150
Context factors	**,607****	**,605****
Organizational context	*,671***	*,529***
Relevance	,731**	,592**
Information	,224	,186
Support	-,213	-,254
Characteristics of the E-Portfolio System	*,572***	*,584***
Quality of Output	,498**	,610**
Usability	,561**	,569**
Attitude	,803**	
Behavioural acceptance (usage)	,506**	,512**
Personal + contextual Factors	,639**	,629**

r_s = Spearman correlation coefficient - Note: * $p \leq .05$, ** $p \leq .01$ (two sided significance test)
$r_s \geq$+-0,1 minor effect, $r_s \geq$+-0,3 medium effect, $r_s \geq$+-0,5 strong effect

	Behavioural acceptance r_s
Attitude	,512**

For the following assumptions very high correlations had been confirmed as significant:

- The subjective norm and the type of care influence the motivation to work with e-portfolios.
- The higher the subjective learning success, the perceived behavioural control as well as the perceived benefits are, the greater the motivation to work with e-portfolios will be.
- The perceived relevance of the curriculum, the quality of output and the perceived usability of Mahara have a positive effect on the motivation for e-portfolio work.
- Motivation and attitude of acceptance are closely related. The higher the motivation to work with e-portfolio is estimated, the higher the attitude will be.
- As in other studies also in this study a relationship between attitude and actual usage have been confirmed.

Interestingly, no significant correlation between gender, school-related self-efficacy, computer technical knowledge, the IT-affinity, information about the e-portfolio system as well as the support and motivation to work with e-portfolios has been found.

In the following, the resulting model for motivation and acceptance of working with e-portfolios in the school of practical studies teacher / internal training is presented in a summary. Figure 3 shows the adapted model for motivation and acceptance of working with e-portfolios in the school practical studies, which represents the relationships between each factor and the motivation and acceptance

Yet it does not allow any statements about causal effect relationships or an overall assessment of the model. Only by using a structural equation analysis (also called „causal analysis“) cause-effect relationships were analysed and interpreted in our model. As a method, a variance-based causal analysis, based on the calculation of partial least squares (PLS) has been used. In contrast to the analysis of covariance-structures it requires no distributional assumptions and can also be carried out using small samples. It includes both formative and reflexive measurement models. With the free software SmartPLS we have found a user-friendly tool that provides extensive calculations for the assessment of the overall model.

For the quality evaluation of structural equation model can be stated that with respect to reliability and validity good results have been achieved and that the operationalization of the latent variables succeeded in the overall model. Much of the relations between the influencing factors and the declared impact could be confirmed. Only the direct relationship of the factors for attitude had to be removed from the model. Furthermore interesting is that the actual use (i.e. the behavioural acceptance) of the e-portfolio still has to depend on other factors that were not considered in this model. One possible factor could be the available time that students were able the students spend.

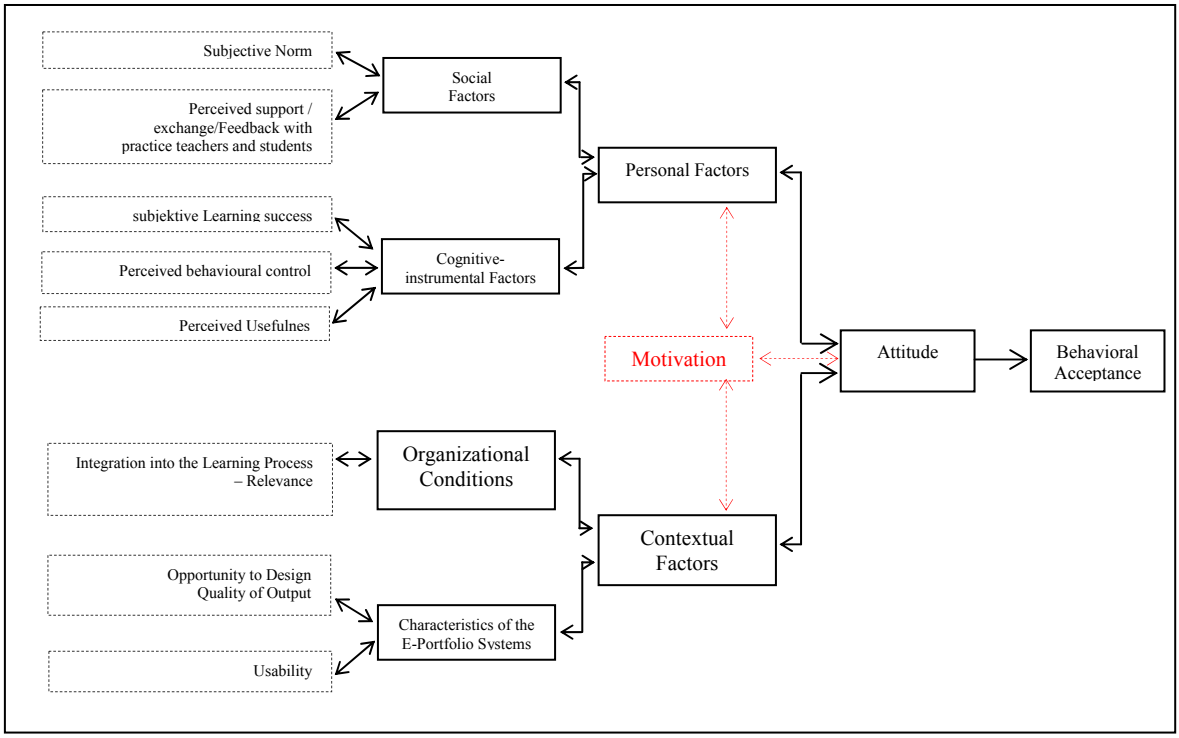

Figure 3. Resulting model of motivation and acceptance of e-portfolios

5. CONCLUSION

In conclusion, it can be stated that motivational and technological factors as well as their impact and relationships were analysed systematically between the proposed latent variables. It has been found that the model used basically provides a valid and reliable assessment of motivational and technological aspects of working with e-portfolios. For the interpretation of the results it must be taken into account that the sample of 64 subjects is a somewhat small and eventually the results and have a limited scope only. In addition, in this study, no effect on the nature and quality of the responses was made to the e-portfolio entries, but only a minimum level of feedback from the process-oriented group has been defined. For future research it would therefore be interesting to set priorities in the field of qualitative feedback here and investigate further development steps. In addition, the results presented here should be reviewed with a representative sample.

In summary, the following five recommendations for the use of e-portfolios in the school of practical studies of teacher can be derived from the empirical study:

1. Create a positive expectation for working with e-portfolios with students.
2. Give good and consistent support during the work phase and appreciative, positive feedback.
3. Focus on relevance and usefulness for future teaching.
4. Offer templates and views but still leave most freedom in the design of e-portfolios.
5. Carefully select the e-portfolio system.

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