# Self-directed Learning in e-Portfolios: Design Issues and Investigation of Students' Performance

Athanassios Jimoyiannis(✉) and Panagiotis Tsiotakis

Department of Social and Educational Policy,
University of Peloponnese, Korinthos, Greece
{ajimoyia,ptsiotakis}@uop.gr

**Abstract.** This paper presents an investigation on students' learning presence in a blended post-graduate course, designed to promote self-directed learning through e-portfolio activities. The theoretical foundations and the key dimensions of e-portfolio learning activities are outlined, i.e. students' construction, reflection and collaboration. Following are presented the organizational and the analysis framework of students' self-directed learning and constructive activities within the e-portfolio. Descriptive analysis and Social Network Analysis of the research data revealed important information regarding individual performance, interaction and collaboration among participants as well as the whole e-portfolio community.

**Keywords:** e-portfolios · Self-directed learning · e-learning · Social network analysis

## 1 Introduction

In the past decade, the emerging Web 2.0 technologies have fundamentally changed the way we think about e-learning environments, pedagogical strategies, students' activities and learning outcomes. By providing flexible, participatory, learner-centred, communicative and networked spaces, Web 2.0 tools offer multiple opportunities for students' engagement, communication, reflexive dialogue, creativity, collaborative and self-directed learning [11]. In this context, Web 2.0 technologies challenge educators and institutions to consider new ways of delivering their programs by (a) extending learning environments from time and space bound classroom places and (b) adopting new models of pedagogy which offer authentic learning opportunities through self-directed, participatory, collaborative and social learning processes [4].

Among Web 2.0 tools, e-portfolios constitute a new means of enhancing e-learning in practice; they are increasingly becoming popular in tertiary education to support students' learning and personal development [1, 6]. Literature review indicates that e-portfolios are dynamically used in order to embed learner-centred and reflective strategies in primary and secondary education [3, 12], undergraduate and post-graduate education [9, 16], teacher education [14] and continuing professional development [10]. A wide range of published studies were directed towards students' perceptions of e-portfolios and their experiences during learning activities


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within e-portfolios [2, 5]. Despite the promising uses of e-portfolios in education, empirical research on students' active engagement, collaboration and the consequent learning outcomes is rather limited. This study has the ambition to contribute by proposing a consistent pedagogical framework to design, promote, and analyse students' collaborative learning in e-portfolios, which is based on the principles of *social learning* theory [17]. The methodological issues of the research as well as the preliminary findings of both descriptive analysis and Social Network Analysis are presented in order to depict students' engagement, interaction, creativity and collaboration. Finally, conclusions are drawn for future development and research in the area of e-portfolios and self-directed learning.

## 2 Theoretical Background

In their traditional view, learning portfolios help students to collect their assignments, to present selected artefacts and showcase examples, and to reflect on their work and achievements. Currently, an e-portfolio is a dynamic Web space maintained and created by a learner, a group of learners, participants in a course or a whole community; it includes demonstrations, resources, accomplishments, articulated experiences, individual and collaborative creations, as well as peer feedback. By embodying Web 2.0 functionalities, e-portfolios enhance their features of publishing, archiving, sharing, communication and collaboration (i.e. by including tools like forums, blogs, wikis, content sharing etc.). In this perspective, the notion of e-portfolio is not restricted to an online collection of individual students' work or selected artefacts. This study considers an e-portfolio as a combination of a *learning process* (a series of individual and collaborative activities) and its *product* (content material and students' creations during the e-portfolio timeline). Overcoming the constraints of time and physical space, the key factors to harness the full advantages of e-portfolios are (a) learners' *reflection* on individual and peer artefacts as well as the overall e-portfolio content, and (b) the *collaboration* and feedback provided by peers.

The theoretical foundations determining this particular research and the design of students' activities within the e-portfolio were rooted in the ideas of social learning. More specifically, we have developed a combined pedagogical framework determined by the notions of *community learning* and *collective thinking* [15, 17]. In this context, three mutually related components were identified, which afford e-portfolios as dynamic learning environments and characterize social participation as the key factor of the learning process [7]:

**Construction:** This dimension projects (a) planning, organization and development of individual students' work and (b) the documentation of representative work samples (artefacts) that provide tangible evidence of students' knowledge and skills.

**Reflection:** It is students' critical thinking on individual and peer work, artefacts, knowledge material, achievements and learning. It helps students to construct a sense of their learning and developmental processes.

**Collaboration:** Meaningful reflection is best facilitated by peer collaboration and mentoring within a learning community evolving in the e-portfolio spaces.

## 3 Study and Method

### 3.1 Context and Design of e-Portfolio Activities

The present intervention ran during the spring semester of 2013, in the context of a masters' degree course entitled "e-learning and ICT in education", at the Department of Social and Educational Policy, University of Peloponnese, in Greece. The course was designed in a blended format; it included five face-to-face sessions in the classroom combined with on-line collaborative work in the e-portfolio. Mahara was used as the hosting platform. Twenty three students were enrolled. They all had a bachelor degree in various disciplines related to education; twenty students were in-service primary and secondary education teachers.

Students' individual and collaborative work were deeply interconnected and spread along the timeline of the 24 weeks initiative. The instructor was acting as e-moderator by setting the context, the expectations and the processes of students' self-directed learning. An ongoing cooperation framework was shaped based on dialogue, peer interaction and collaboration. The students were encouraged (a) to change ideas on theoretical and pedagogical issues, (b) to share content material and write articles on the e-portfolio journal, (c) to reflect and debate on course assignments and peer contributions, (d) to share resources, educational material and experiences, and (e) to create interest/working groups and design new educational scenarios applicable in school practice. Each student was requested to publish five articles on the blog and create a WebQuest scenario using the OpenWebQuest platform [13].

### 3.2 Analysis Framework

Our research approach aimed to better monitor, support and analyse students' repetitive and iterative activities during the course at three mutually related levels, i.e. (a) personal, (b) group and (c) community level. Therefore, the conceptual analysis framework was built around four interrelated dimensions which reflect the complexity of students' learning presence within the e-portfolio community.

**Engagement**: Individuals' self-presentation and social presence, participation in general discussions and ways of attending e-portfolio activities;

**Interaction-Reflection**: Negotiation of ideas and meaning through discussion forums and live journal articles, engagement in peer working groups;

**Creativity**: Students' content contributions, ability to create/share new knowledge and co-create new artefacts in the e-portfolio community;

**Cohesion**: Ties between individuals and the e-portfolio community as a whole;

Every individual contribution was used as the analysis unit. We have captured a wide range of data, like distinct logins, postings, article publications and commentaries, content additions, working groups, page views, links etc. Therefore, we used three main sources and types of data analysis:

- Log data gathered from the platform to reveal students' engagement.
- Descriptive analysis of individual contributions (i.e. publications and commentaries on the journal area, postings to discussion forum topics etc.).
- Social Network Analysis of individual contributions to reveal members' ties and the dynamics of the e-portfolio community.

# 4 Results

## 4.1 Engagement

Figure 1 shows the main page of a typical student e-portfolio. It presents her activities and the artefacts she produced during the course workflow. It is organized in four parts projecting (a) individual and collaborative tasks, (b) personal creations, (c) Web links and suggested readings and (d) articles/personal writings. The majority of the students used a similar structure to organize and project their e-portfolio content.

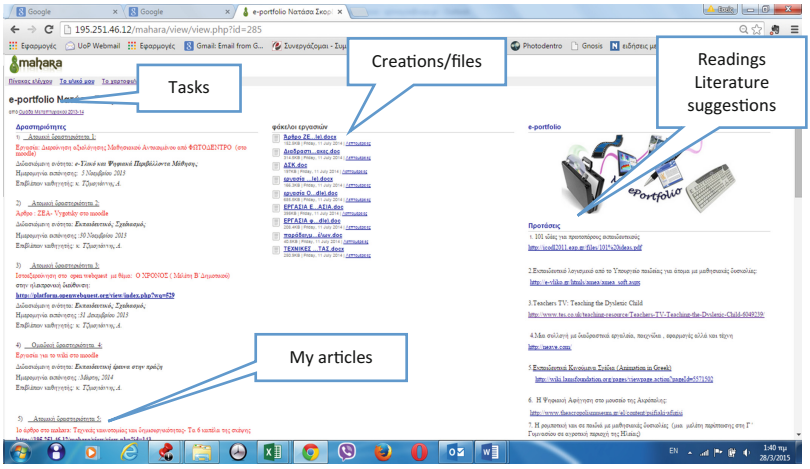


**Fig. 1.** A typical e-portfolio structure of students' individual and collaborative creations

Engagement indicators are related to students' presence in general discussions as well as individual actions concerning e-portfolio content view. Figure 2 shows the distribution of the community activity depicting distinct logins per week. The arrows indicate the dates of the face to face sessions. Students' activities were continuous and interspersed in a balanced manner; a mean value of 133 distinct logins per week was

recorded. Figure 2 gives a picture of an active learning community along the 24 weeks period of operation. The peaks in students' activity are recorded, approximately, a week after the deadline of the article assignments (9th, 12th, 15th, 19th, 22nd week).

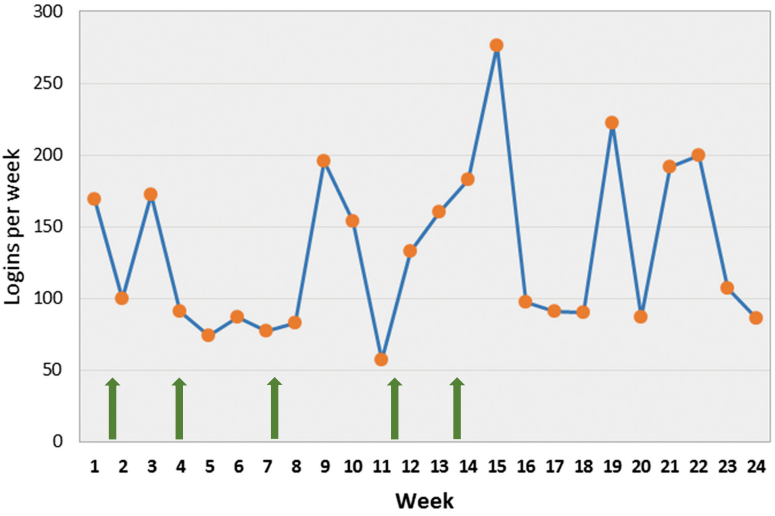


**Fig. 2.** Students' activity distribution chart

### 4.2 Creativity and Reflection

The majority of the students were very efficient members towards negotiating and sharing their ideas and knowledge through discussion forums and live journal articles. In addition, 14 working groups were spontaneously appeared in the platform as the outcome of students' initiatives. They were built around common interests with the aim to collaboratively study new educational topics and design new educational scenarios applicable in the school practice.

Table 1 depicts an overall view of students' contributions and creations. A total of 135 original articles were published in Mahara's journal area with regards to theoretical and practical themes of learning and instruction (e.g. *Web 2.0 in practice*, *collaborative learning, educational blogging*, *mobile learning*, *game-based learning* etc.). Comprehensive discussions were evolving around the topics above, which received a total of 647 commentaries. In addition, 21 WebQuest scenarios were individually constructed and shared with peers for further comments and reviewing.

### 4.3 Social Network Analysis

Social Network Analysis provides a set of algorithms which give insight into the various e-learning situations in terms of network structure parameters, like interactions and ties among members, information exchange, knowledge sharing, group dynamics,

community structure etc. [8]. *Cohesion analysis* revealed important information regarding the architecture of the e-portfolio community, i.e. the existence of subgroups (cliques) of students who tend to develop strong ties and interrelations with each other. Overall, 49 cliques were recorded; the majority of them (38 cliques) included 10–12 students. This is an indicator that the e-portfolio network was a cohesive community, i.e. the students developed strong interrelations among them, thus having enhanced opportunities for collaborative construction of knowledge.

**Table 1.** Students' e-portfolio activities

| Indicators | **Actions** |
|---|---|
| Discussion topics | 20 |
| Forum postings | 206 |
| Article publications | 135 |
| Article Commentaries | 647 |
| Article views | 10674 |
| WebQuest scenarios | 21 |
| Working groups | 14 |
| Collaboratively constructed educational scenarios | 6 |

*Power analysis* measures the operation of the e-portfolio activity and assesses the impact each member had with respect to spreading information and influencing others. The overall network activity was represented by in-degree centrality = 55.73 and out-degree centrality = 55.56. This means that, approximately, 56 % of the students were mutually connected by receiving and sending postings. Students S10 and S15 were the most influential members, since they received a great number of connections (postings) from their peers. On the other hand, students S3, S7 and S13 were the most effective members in the community towards triggering others (they were connected to 83 % of their peers in the course). Figure 3 represents the degree centrality map. The students placed at the centre were the most powerful participants since they were connected to other powerful members. As moving to the periphery, students S11, S9, S2, and S12 are considered as the less powerful members of the e-portfolio network.

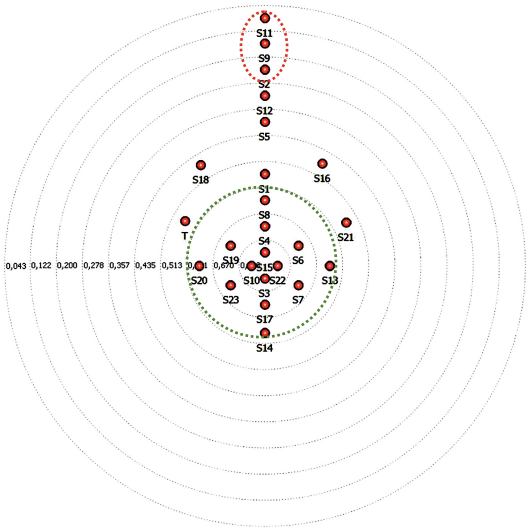


**Fig. 3.** Degree centrality map of the e-portfolio network

Figure 4 presents the *role analysis* diagram which identifies four classes of members which had certain social roles and performance in the e-portfolio network. The first role group (i.e. the nodes placed in the lower right side of the graph) includes eight students, which were the most active participants, i.e. S3, S7, S15, S23, S13, S22, S14 and S21. They were members in more than 20 cliques and triggered others' participation by expressing ideas and writing articles, posing questions, giving responses or uploading commentaries.

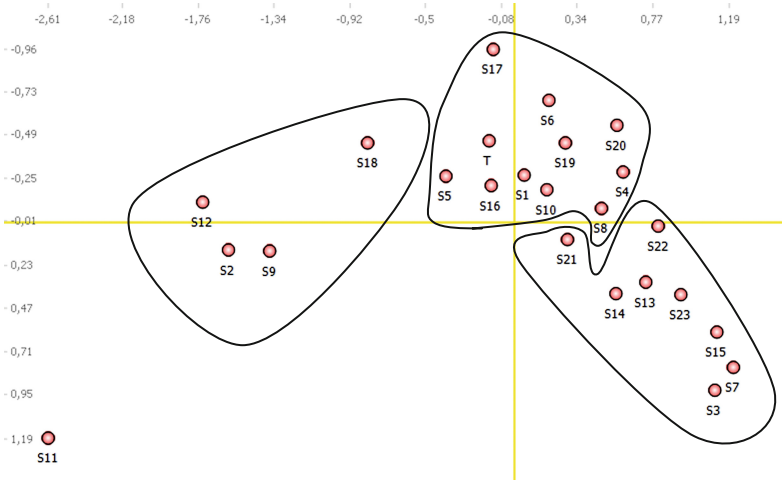


**Fig. 4.** Role analysis graph

The second role group (i.e. upper right side) is consisted of S8, S10, S4, S20, S6, S19, S1, S16, S17 and S5. The tutor T is also placed therein. Comparing to the members of the first group, they had moderate influence to the network since they were involved in 8–20 cliques. The third role group included four students (i.e. S18, S9, S2, and S12). These participants uploaded fewer articles and postings. Most of them were members in 3–7 cliques. Finally, student S11, who had marginal presence in the e-portfolio activities, is characterized as a lurker or isolate. His presence appeared to be restricted to reading the postings/material uploaded by the other students while he was a member in only one clique.

## 5 Epilogue

This paper reported on an investigation concerning the design and the implementation of a blended post-graduate course, structured around students' self-directed and collaborative activities in an e-portfolio. The preliminary data provided supportive evidence of an effective learning program that promoted students' engagement and learning presence within a dynamically evolving community. The majority of the participants demonstrated enhanced interest and they were actively engaged into the e-portfolio activities (writing articles, uploading postings, supporting dialogue and discussion topics, interchanging ideas, sharing content and resources, co-creating educational material, etc.). This non-formal, self-directed program offered promising evidence of a decentralized learning community built around e-portfolio.

The results presented contribute to the existing knowledge and could guide both, future research and the design/implementation of efficient e-portfolio projects. This study suggests that properly designed e-portfolio initiatives need to consider students' learning as the outcome of individual and collaborative work as well as self and peer reflection on students' creations. In this context, it is expected that students can achieve higher cognitive levels through communication, collaboration and critical thinking within a supportive community of learning. The conceptual framework proposed can also help educators and instructional designers to adopt an open learning philosophy towards implementing e-portfolio initiatives with the aim to enhance students' engagement, reflection, collaboration and self-directed learning.

Our current efforts are addressed to combine social network analysis with qualitative data extracted from students' interviews and content analysis of their on-line discourse. We expect thus to reveal important information about individual learning presence and knowledge construction, students' connections and influence as well as the learner identity they developed by sharing common practices and values within the e-portfolio community.

## References

1. Becta: Impact Study of e-portfolios on Learning. Becta, Coventry (2007)
2. Bolliger, D.U., Shepherd, C.E.: Student perceptions of ePortfolio integration in online courses. Distance Educ. **31**(3), 295–314 (2010)

3. Chang, C.C., Tseng, K.H.: Using a Web-based portfolio assessment system to elevate project-based learning performances. Interact. Learn. Environ. **19**(3), 211–230 (2011)
4. Dede, C.: Reconceptualizing technology integration to meet the challenges of educational transformation. J. Curriculum Instr. **5**(1), 4–16 (2011)
5. Fong, R.W., Lee, J.C., Chang, C., Zhang, Z., Ngai, A.C., Lim, C.P.: Digital teaching portfolio in higher education: Examining colleagues' perceptions to inform implementation strategies. Int. High. Educ. **20**, 60–68 (2014)
6. JISC: Effective Practice with e-portfolios: Supporting 21st Century Learning. Higher Education Funding Council for England, Bristol (2008)
7. Jimoyiannis, A.: Developing a pedagogical framework for the design and the implementation of e-portfolios in educational practice. Themes Sci. Technol. Educ. **5**(1/2), 107–132 (2012)
8. Jimoyiannis, A., Tsiotakis, P., Roussinos, D.: Social network analysis of students' participation and presence in a community of educational blogging. Int. Technol. Smart Educ. **10**(1), 15–30 (2013)
9. Kabilan, M.K., Khan, M.A.: Assessing pre-service english language teachers' learning using e-portfolios: benefits, challenges and competencies gained. Comput. Educ. **58**, 1007–1020 (2012)
10. Lygo-Baker, S., Hatzipanagos, S.: Enabling professional development with e-portfolios: creating a space for the private and public self. Int. J. Online Pedagogy Course Des. **2**(1), 37–52 (2012)
11. McLoughlin, C., Lee, M.J.W.: Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. Australas. J. Educ. Technol. **26**(1), 28–43 (2010)
12. Meyer, E., Abrami, P.C., Wade, A.C., Aslan, O., Deault, L.: Improving literacy and metacognition with electronic portfolios: teaching and learning with ePEARL. Comput. Educ. **55**, 84–91 (2010)
13. OpenWebQuest (2015). http://openwebquest.org
14. Shepherd, C.E., Skrabut, S.: Rethinking electronic portfolios to promote sustainability among teachers. TechTrends **55**(5), 31–38 (2011)
15. Siemens, G.: Learning ecology, communities, and networks extending the classroom (2003). http://www.elearnspace.org/Articles/learning_communities.htm
16. von Konsky, B.R., Oliver, B.: The iPortfolio: measuring uptake and effective use of an institutional electronic portfolio in higher education. Australas. J. Educ. Technol. **28**(1), 67–90 (2012)
17. Wenger, E.: A social theory of learning. In: Illeris, K. (ed.) Contemporary Theories of Learning, pp. 209–218. Routledge, Abington (2009)