

The Portfolio as Artifact and Actor

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This article proposes a tentative framework to support empirical analysis of portfolios as pedagogical tools for formative and summative assessment in higher education. It aims to get a deeper understanding of the role of the portfolio in student learning both as a tool and as representations of this tool. To that end, we use three sets of theoretical ideas: Wartofsky's conceptualization of perception through the creation of artifacts, actor-network theory, and Wertsch's notions of internalization, appropriation and mastery. This article is meant to complement current portfolio research with an original approach that addresses explicitly epistemological questions and concepts like learning and knowledge and explores possible avenues for analyzing and understanding portfolios as artifacts and tools in learning activities.

BACKGROUND

Portfolio assessment has been extensively introduced in higher education in recent years, as an alternative to the so-called testing and measurement tradition (Tigelaar, 2005). Most of the available literature on portfolios focuses on *teaching portfolios* (Barett, 2005), but the kind of portfolio that we address in this article is the *student portfolio*, used in different study programs within higher education as a tool both for learning and for assessment.

Assessment of student achievement is changing, and the reason for this change might be that today's students face a world that seems to demand new types of knowledge and abilities: In particular, it is often pointed out that students need to become lifelong learners in a world that will demand competencies and skills not yet defined (Segers, Dochy, & Cascallar, 2003). New modes of assessments are being tried at all levels of the educational systems, and portfolio assessment is one example of an assessment practice that is becoming increasingly popular in higher education (Chetcuti, Murphy, & Grima, 2006). In the United States, portfolio assessment was introduced about 15 years ago and spread quickly to all the levels of the educational system. England also has a tradition of assessment through *coursework*.¹ Portfolios have also been implemented in other parts of Europe and educators are still exploring and developing new or different ways of using them.

It must be noted that the practices and purposes of portfolio assessment vary greatly from one educational context to another and from one didactic tradition to another (Chetcuti et al.,

¹There are similarities between *coursework* and portfolio assessment, but there is also important differences. We choose not to discuss these in this article.

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2006). The existence of a wide range of patterns of understanding portfolio assessment may lead to tensions, especially in situations where the purpose of portfolio assessment has not been made explicit (Johnston, 2004). The purpose of portfolio assessment can be seen as ambiguous because portfolios and other forms of documentation that involve reflection and self-reflection can be seen as rooted into two very different traditions (Dysthe & Engelsen, 2004). The first tradition is the “competency movement,” which stresses the documentation of *competency* in different subjects or areas. Within this tradition, the portfolio can be seen as an expanded curriculum vitae used for the purpose of presenting oneself, for example, when applying for jobs. The other root can be traced back to humanism and constructivism, especially within the realm of process-oriented writing (Flower & Hayes, 1981). Much of the literature from this tradition describes the main aim of introducing portfolios in an educational program as enhancing disciplinary and personal development; reflection also often plays an important part in the learning process together with peer review and teacher response (Davies & LeMahieu, 2003).

The intention of this article is to develop new forms of understanding and a framework for analyzing the activities that take place when portfolios are used in student learning. To that purpose, we take both of those roots into account. Moreover, we do not draw a definite line between the notion of competency and that of personal development, as we see them as intimately intertwined. What we put forward in this article is a model for analysis of portfolios and their different representations that can equip us with tools to understand the transformation between the different representations, both when their main purpose is to document competency and when they are primarily used to advance reflection and collaboration.

We primarily attempt to shed light on the function of a learning portfolio in the context of higher education. To that purpose, we propose to investigate the various representations of the portfolio, as well as the practices of portfolio assessment as a pedagogical tool. This article suggests a conceptual tool that can be used to analyze patterns of design and patterns of use of a portfolio and can therefore be used for uncovering and discussing discrepancies between design and use. Our investigation does not take a particular “designer” or “user” perspective, and the conceptual model suggested in this article is meant to provide insights both for those involved in designing portfolios and for those that use them (students, teachers, mentors, examiners, etc.).

Research in the Field of Portfolio Assessment

The existing literature often focuses on presenting the positive effects of portfolio assessment on student learning. For example, Davies and LeMahieu’s (2003) meta-study concludes that portfolio assessment generally leads to better learning and teaching, including greater student motivation, increased student ownership and responsibility, easier feedback, and the possibility for learners to show the breadth and depth of their learning. Klenowski (2002) also underlined the positive aspects of portfolio use:

Research findings conclude that the use of portfolios promotes the development of important skills such as reflection, self-evaluation and critical analysis. Portfolios are being used increasingly for assessment and learning purposes because of the potential for the associated curriculum and pedagogical practices to foster metacognitive development. (p. i)

Indeed, examples from the literature of how portfolio assessment has been found to have a positive impact on student learning are plentiful: Portfolios have been described as enhancing the students' depth of understanding of their academic curriculum (Segers et al., 2003), as encouraging communication between teacher and student (Smith & Harm, 2001), as increasing the students' abilities for reflection and self-evaluation (Dochy, Segers, & Sluijsmans, 1999), as well as their overall motivation and their sense of responsibility and ownership (Dochy & McDowell, 1997).

Some authors such as Barrett (2005) consider that much of the available literature on student portfolios approaches the topic from a pragmatic angle. For example, some of the work published in the area does not provide a full epistemological and ontological investigation of exactly what the positive effects of student portfolios are and how they are achieved. This problem is described, for example, in a synthesis on portfolio research by Herman and Winters (1994). Furthermore, some of the literature presents assertions on the value of portfolio assessment without first introducing to the reader the authors' theoretical foundations on learning and knowledge. For instance, Johnston (2004) pinpointed that the relation between theory, research, and practice is often hazy, and the literature on portfolio assessment, although it is often based on specific research traditions, rarely acknowledges those traditions explicitly.

Real-Life Examples of Portfolio Assessment Practice

It is interesting to note that the term *portfolio* is used to cover a wide range of pedagogical practices. It is used not only to describe the physical artifact that students build up either for their own sake or for the purpose of formative or summative assessment but also to refer to the various working patterns that arise when taking such tools into use, as well as the ways various types of users think and talk about the artifacts. In addition, the portfolio is sometimes seen as having a more "idealistic" purpose, supposedly creating a bridge between the "theoretical" and the "practical" part of an educational program, as well as a bridge between the world of education and that of professional practice. To illustrate the purposes and practices of portfolio assessment, we describe two examples of actual portfolio assessment practices at Oslo University College, one from a part-time undergraduate nursing program and another from a full-time undergraduate program in journalism, library, and information science. The examples are taken from a report by Wittek and Havnes (2005).

Example 1: Nursing education. The entire part-time undergraduate program in nursing education views the portfolio as a tool for learning and assessment. During a period of 4 years, the students will experience a variety of teaching and learning methods, including lectures, colloquia, group work, laboratory work, project work, supervision, and clinical studies. One of the main goals of the program is to provide the students with the ability to combine knowledge and experience from both nursing theory and clinical work. To achieve this goal, the students are given several assignments throughout the academic year. At the beginning of the year, the students are organized in core groups of five to eight students. Each one of these core groups will, together with a supervisor, set up a work schedule and choose the topics and the form of various assignments based on the requirements of the curriculum. A 37-page booklet provides guidelines as to what the students are supposed to do, and how they are supposed to do it, but leaves room for interpretation and choice in a number of areas. Some of the compulsory

assignments have to be performed in groups, others individually. Before submitting the final version of their assignments, the students will present various drafts to their supervisors and to their peers, who will provide them with formative assessment in the form of feedback. Those drafts will serve as documentation for the students' progression throughout the course. The students go through four summative assessment sessions during the course, which are based in part on a selection of items from the portfolio.

Example 2: Journalism education. In this program the students are also organized into study groups during the entire year, but the supervisors have a more important role in organizing and leading the group activity than in the nursing program. In particular, the topic of each assignment is given by the supervisor, and there is little room for interpretation. In addition, these assignments have absolute deadlines to reflect the reality that will confront the students in the workplace. The study groups meet every week and present an outline of their assignment to their supervisor and their peers, who both provide them with formative assessment in the form of oral feedback. The final version of each assignment has to be approved by the supervisor as "good enough" before it can be included into the portfolio. The summative assessment session takes place at the end of the year and is based on a selection of texts from the portfolio and a reflection note written by the students about their "portfolio selection." The grade given for the "portfolio selection" can then be adjusted after an oral examination.

Aim and Structure of the Article

In this article we propose one possible way of conceptualizing the various meanings of the term portfolio. Our perspective includes the physical aspects of the portfolio as well as its more general meanings, for example, as a structuring tool for the students' learning activities, as a strategy toward knowledge acquisition and organization and as a tool for autonomous self-assessment.

For that purpose, we propose to use three different sets of concepts borrowed from the literature. We start with examining the notion of artifact and introducing Wartofsky's taxonomy, which helps us shed light over the various representations of the portfolio as artifact. The next section presents some of the conceptual tools that we propose to borrow from actor-network theory (ANT). Such conceptual tools offer a complement to Wartofsky's taxonomy in that they help us focus on the essential attributes that make a portfolio a significant actor in the process of student learning. We then introduce Wertsch's concepts of mastery and appropriation, as we believe that those two additional concepts can bring a further dimension to our investigation of the role of the portfolio in the transformation from student activity to collective and individual construction of knowledge. The following section is dedicated to more specifically discussing the ideas presented earlier in light of portfolio assessment before concluding the article.

THE NOTION OF ARTIFACT

Background

A fundamental assumption in a sociocultural perspective on human thinking and learning is that these activities are always connected to the use of cultural artifacts and to the community where

they are used (Vygotsky, 1978). Learning is not something that happens solely *inside* a person's head; it also takes place through the use of a particular set of *tools* in productive ways and for particular purposes. When individuals enter a particular context, they participate in the group's conventions and take into use the specific tools that are involved in the group's interactional activities. They thereby learn how to use those tools in a way that is "proper" within that context. Learning and thinking are activities that take place at both an intrapersonal and an interpersonal level. These two levels are closely connected, and they cannot be understood independently of each other. Learning and development concern how individuals, organizations, and societies at large retain information, knowledge, and skills and make them available to new generations through artifacts (Säljö, 1999).

Physical and Intellectual Artifacts

Säljö's (1999) explained that artifacts are instruments and processes developed for a specific purpose, although they may end up being used for different purposes than those they were originally intended for. Human knowing becomes externalized through those artifacts. He argued that, although artifacts are often described as either physical or intellectual, such a distinction is probably overly artificial and that it is more constructive to understand the tools that are used by people in concrete activities to be simultaneously intellectual and physical. He considered that concepts, definitions, and procedures are intimately linked to practical knowledge and challenged the common view that theory and practice are two distinct and conflictual entities. In this perspective, it is more adequate to see cultural tools as resources that mediate learning. "The mediational means—physiological and physical tools—that people use in concrete activities must be understood as simultaneously physical and intellectual in nature" (p. 138).

The concept of artifact offers a useful point of contact between the historicity of humanity and its present context and between artifacts that mediate activity and the group of people acting on the artifacts. The increasing sophistication of tools that occurs over time is an important dimension in sociocultural development (Ivarson, Schoultz, & Säljö, 2002). Powerful intellectual distinctions and resources are built into tools that are used for a wide range of purposes when performing activities such as calculating, communicating, or reading. "There is no such thing as pure cognition that can be assessed *per se*" (p. 85).

All cultural artifacts have been modified over time by their incorporation into human activity. In other words, the physical tools made by human culture and human reasoning are interwoven. Human learning and thinking are ultimately connected to the development of artifacts. When we act within the context of a culture on the tools available within this culture, we draw heavily on human knowledge developed by earlier generations, even if we are not aware of it. Language has been described as the most important of all human artifacts, as psychological tools stored in language are used as resources in all kinds of activities (Linell, 1998).

This is a nondualistic position on knowing and learning. We mean that the human mind and the use of artifacts (especially language) must be looked upon as different aspects of the same process of learning. The portfolio therefore needs to be understood as a tool that is involved in activity and as an artifact that is constituted by the tensions and dynamics between persons and tools within the realm of this activity. In this article we aim to find theoretical tools that will help us better understand the relationship between the portfolio and the learning activities of the students that use it.

Wartofsky's Taxonomy. To elaborate on the notion of artifact, it can be useful to bring forward the three dimensions of the artifact first presented by the philosopher Marx W. Wartofsky (1973), who suggested that perception is a highly sophisticated mode of human action. Representations mediate perception modes of acting. Three modes of representation can be distinguished as primary, secondary, and tertiary artifacts. This section is an attempt to give a brief overview of those three dimensions, which are used next in this article to illustrate the particular case of portfolio assessment. It needs to be noted that those modes of representations are not discrete (any one unit of activity could include all three modes of representations) and that there is no hierarchy among them.

Primary artifacts are directly used in *production*, such as “axes, clubs, needles, and bowls” (Wartofsky, 1973, p. 164). Primary artifacts can also be instruments such as a pencil, a word processor, or a piece of medical equipment. All these artifacts are *directly used in the activities* that people engage in. The modes of this representation may be gestural, oral, or visual, the only prerequisite being that they need to be available to others through perception.

Secondary artifacts consist of *representations* of primary artifacts. It needs to be noted that the notion of representation is a functional one, in the sense that anything that is capable of preserving and transmitting a mode of action, thus representing it, serves that function. Secondary artifacts can be modes of action using primary artifacts (like hammers or computers), as well as routines, norms, rules, or concepts about them. These secondary artifacts play a central role in preserving and transmitting modes of action and beliefs. An example of a secondary artifact may be a handbook developed by the teachers to guide the students in how they are expected to conduct their portfolio work. However, secondary artifacts do not necessarily have a physical, palpable form. They can also be nonphysical artifacts, such as the patterned use of the primary artifact as acquired through interaction with students, interaction between student and teacher, or interaction between students and their own or other students' portfolios.

Tertiary artifacts represent a class of artifacts “which can come to constitute a relatively autonomous ‘world’ in which the rules, conventions and outcomes no longer appear directly practical, or which, indeed, seem to constitute an arena of non practical, or ‘free’ play or game activity” (p. 208). The tertiary artifact has become a part of a person's or an institution's way of acting, and the direct productive or communicative praxis is weakened to such a point that the formal structures of the representation are taken in their own right as primary and are abstracted from their use in productive ways. Tertiary artifacts are imaginative—they can come to color the way we see the world, providing a tool for changing current practice. Modes of behavior acquired when interacting with tertiary artifacts can transfer beyond the immediate contexts of their use:

They constitute a domain in which there is a free construction in the imagination of rules and operations different from those adopted for ordinary “this-worldly” praxis. Such possible worlds may indeed reflect the limits of the perceptual praxis in a given “actual” world, i.e., a world in which direct outward and necessary productive praxis takes place, in accordance with rules and ontologies evolved through this praxis. That is to say, just as in dreams our imagery is derived from our ordinary perception, but transcends or violates the usual constraints, so too in imaginative praxis, the perceptual modes are derived from and related to a given historical mode of perception, but are no longer bound to it. (p. 209)

An example of tertiary artifact could be new modes of thinking and acting acquired as a result of portfolio experience. The portfolio can be considered as truly appropriated when its

former users have integrated it to such a point that they no longer relate to the primary artifact. For example, it can be imagined that journalists who have worked with portfolios during the studies described in the second example would develop a working culture whereby colleagues routinely give feedback to each other's texts and whereby it becomes natural for journalists to archive their texts and make them available in a structured manner.

Need for additional concepts. We believe that Wartofsky's taxonomy equips us with a set of concepts that are useful for the purpose of a study of portfolio assessment. In particular, it allows us to conceptualize the various representations of portfolios and the dynamic aspects of the transformation from one representation to another. It helps us understand artifacts not only as objects but also as constitutive of the knowledge and conventions that are created and developed within a particular context. However, this model does not have the same kind of explanatory power with regards to the concrete role of the artifact in the activity of learning. In our search for a more specific tool that would help us shed light on the artifacts' role in learning, we turned to another school of thought, namely, ANT.

CONCEPTUAL TOOLS FROM ANT

Background

ANT was originally developed within sociology of science by Michel Callon (1986) and Bruno Latour (1987). At the outset, it is important to note that ANT is no "unified body of knowledge" (Walsham, 1997, p. 468). However, a number of key concepts may be identified as forming the core of the theory. One of the most crucial and controversial tenets of ANT is the rejection of the traditional distinction between the realm of the social on one side and the realm of nature and of the technical on the other. In ANT terms, the social and the technical are inseparable and should be treated *symmetrically*. Latour (1996b) argued that many of the entities that we may consider to be either social or technical are actually hybrids that incorporate both social and technical elements.² He provided the example of the blurring of boundaries between organizational and computer systems:

It is no longer clear if a computer system is a limited form of organization or if an organization is an expanded form of computer system. Not because, as in the engineering dreams and the sociological nightmares, complete rationalization would have taken place, but because, on the opposite, the two monstrous hybrids are now coextensive. (p. 302)

Actors and actor-networks. Within an ANT perspective, both humans and nonhumans can be conceptualized as *actors* (or *actants*³), that is, as "entities that *do* things" (Latour, 1992, p. 241). Akrich and Latour (1991) provided a relatively comprehensive definition of the word *actant*:

²The idea that human bodies and identities may result from a construction that crosses the boundary between society and nature is also a central element in the work of Haraway (1991, 1992) on cyborgs.

³In this article, we choose to use the word *actor* for both human and nonhuman actors (or actants).

Whatever acts or shifts actions, action itself being defined by a list of performances through trials; through these performances are deduced a set of competences with which the actant is endowed; the fusion point of a metal is a trial through which the strength of an alloy is defined; the bankruptcy of a company is a trial through which the faithfulness of an ally may be defined; an actor is and actant endowed with a character (usually anthropomorphic). (p. 259)

For example, a speed bump—appropriately called a “sleeping policeman” in French—can be considered an actor because it causes car drivers to slow down (Latour, 1994). In the same vein, microbes can also be considered actors as they multiply, form “colonies,” trigger disease, and cause epidemics. They are also simulated in a laboratory and eventually “domesticated” in the form of inoculation vaccines (Latour, 1988b). The ANT literature provides numerous examples of nonhuman actors, ranging from scallops (Callon, 1986) to urban infrastructure projects (Latour, 1996a) or mechanical door-openers (Latour, 1988a).

Actors may mobilize other actors by enlisting their support, “enrolling” them as allies, thereby creating a hybrid entity, an aligned network of elements that share the same interests and work toward the same goal. This set of heterogeneous (both human and nonhuman) elements that are connected and that influence each other is called an *actor-network*. One of the major focuses of empirical work based on ANT is to identify how actor-networks of aligned interests are established and maintained over time (Latour, 1988b) or how attempts to create or sustain such networks fail (Latour, 1996a).

Inscription and translation. The concepts of inscription and translation are of particular interest to us. *Inscription* (Akrich & Latour, 1991) refers to the way patterns of use are incorporated and encoded in objects. An illustration of how objects may become inscribed is given by Latour (1991), who took the example of a hotel manager trying to find a way to ensure that customers will leave their room keys at the front desk before exiting the hotel. This manager can try to talk to the customers and communicate to them the imperative statement that keys have to be left at the front desk, but this is often not enough. A further step would be to put up a sign, with the imperative statement inscribed on it. If this is again not enough, the hotel manager may try to attach a large metal weight to each key, which makes it cumbersome for customers to carry their key around and increase the likelihood that they would want to leave it at the hotel. In that sense, one can say that the metal weight embodies the desired pattern of action, in other words, that this new bulky appendage is *inscribed* with the hotel manager’s imperative “please leave your keys at the front desk.”

Designers create objects and services on the basis of imagined users and scenarios of use. They attribute “specific tastes, competencies, motives, aspirations, political prejudices” to the future users and “assume that morality, technology, science, and economy will evolve in particular ways” (Akrich, 1992, p. 208). On the basis of the imagined scenarios of use, designers inscribe a *program of action* into the product they create: Users need to have a particular set of competencies, and different users may be ascribed different roles. The object then becomes an actor that will impose (or “try” to impose) its program of action on its users.

This is not to say that the use of an object or service is necessarily determined by the way it is built. A product, although it contains a particular set of inscriptions, is not necessarily used in the way it was designed to be used. Actual use may deviate from the inscribed program of action, as users start using the object in unanticipated ways, either unintentionally or intentionally. This

phenomenon is referred to as *translation* in ANT. Users translate, interpret, modify, reconstruct, renegotiate the object or service that they use to make it fit within their own specific context.

Further Thoughts on the Combination of ANT and Socio-Historical Perspective

So far we have brought together two sets of concepts that both shed light on the nature of the portfolio as artifact. We believe that those two sets of concepts belong under the same epistemological umbrella. Even if ANT and sociocultural theory are rarely used in combination with each other, this epistemological connectedness forms a natural basis for our purpose. In particular, the notions of inscription and translation appear to be helpful in depicting the concrete consequences of the various representations in portfolio use.

The main notions we have been focusing on are that of representation, inscription, and their consequences for learning. More precisely, we propose to look at those consequences not only as supportive or limitative factors for learning but also as a significant constitutive element of thinking and learning within a group or community. This leads us to a further question about the individual's interpretation of the activities they perform as a part of a community. In particular, individuals might respond differently to an artifact depending on the degree to which they consider it useful, appropriate, and relevant to their own learning activities and future professional life. Wartofsky's notion of tertiary artifacts touches on how a representation of an artifact might become part of a person's way of acting and thinking. However, Wartofsky's work treats this notion somewhat abstractly, and we feel the need for a more concrete set of tools in our quest for an understanding of the integration of portfolio activity into a person's constructions of knowledge. In particular, some of the concepts that come to mind when trying to comprehend issues related to portfolio use and integration are the notions of *mastery* and *appropriation*, which have been examined in depth by James Wertsch.

MASTERY AND APPROPRIATION

An interesting and important question is how the use of particular artifacts, like portfolio assessment, leads to the development of particular skills or modes of knowing. To start answering this question, we propose to bring in a number of ideas presented by Wertsch (1998), in particular the concepts of *internalization*, *mastery*, and *appropriation*. Individual ability, he argued, is connected to the extent human groups and members of those groups are able to use and *internalize* particular cultural tools. He did not, however, propose a straightforward definition for the term *internalization*, preferring to leave it open to a certain level of interpretation.

Rather than thinking of internalization as a construct that can be abstractly defined and then applied to concrete examples, I would argue that it is more appropriate to view it as a term whose definition is closely bound up with particular phenomena and examples, and thus a term that takes on a variety of interpretations. (p. 48)

His analysis uncovers two elements that characterize the process of internalization of cultural tools, namely, *mastery* and *appropriation*. Although the process of mastering cultural tools and

that of appropriating them are often “positively correlated” (p. 56), Wertsch (1998) maintained that they should be understood as two distinct and unequivocally different modes of internalization. The need for a distinction between the concept of mastery and that of appropriation is vividly illustrated in a number of studies carried out in Estonia after the end of Soviet rule. The official narratives of history provided by the Soviet school curriculum and the popular media differed greatly from the narratives that could be gathered in more private contexts. Students in school and universities therefore learnt to master the officially sanctioned accounts of history, but they did not appropriate them in the sense that they did not consider them to be “theirs.” Conversely, their knowledge of the unofficial history was largely fragmented and anecdotal, but those were the narratives that they appropriated and felt emotionally attached to.

An interesting question regarding portfolio work is whether the conventions and structures connected to portfolio activities truly become appropriated by the students. In other words, do the specific ways of acting and thinking connected to those activities become a part of the student’s personal and flexible ways of using this tool? The examples previously described provide two different approaches to portfolio design, which might lead to different levels of appropriation. The students in the faculty of nursing are allowed and expected to interpret and translate the guidelines to portfolio building and can presumably appropriate the portfolio to a greater extent than the students in the journalism program, who get much stricter guidance from their mentors regarding how the portfolio is to be built.

The term *mastery* refers to “‘knowing how’ to use a mediational means with facility” (p. 50). A person (agent) that has mastered something knows “how to do it,” but this knowledge does not necessarily have any effect on this person’s thinking or constructs of knowing. *Appropriation* refers to the process “of taking something that belongs to others and making it one’s own” (p. 53) and can happen when portfolio users have integrated portfolio thinking into their working culture, as previously described. When agents fail to appropriate a cultural tool, that is, when they do not consider it as belonging to them, they will probably resist using it. In those situations where they are still required to use it by external forces, such as the government, they are likely to develop various forms of passive resistance.

The issue of nonappropriation of a knowledge content could be seen as a burning one in the field of educational assessment. It is often observed at various levels of the educational system that students that are mostly motivated by the need to get good grades concentrate on fulfilling the requirements of the formal examination. In so doing, they might learn to master the task of acquiring the required knowledge for the purpose of the examination. However, this does not necessarily mean that they have appropriated the content in such a way that would enable them to use it in other contexts than that of the examination. Similarly, students may master portfolio assessment techniques during their studies, but if they fail to appropriate the concept of the portfolio, it is unlikely that portfolio thinking will become a part of their working culture after graduation.

DISCUSSION

Bringing Together Theories

The goal of this article is not to carry out a full-fledged comparison of the theories previously outlined or to develop those theories. Rather, we try and extract from the theories those elements

that we believe are most significant and most useful when trying to get an understanding of portfolios, their various representations, and the potential they may have as pedagogical tools for student learning.

We are aware of the problems that may arise when bringing together theories that belong to different disciplines and schools of thought: Wartofsky's work on mediation and perception and Wertsch's studies of mediational tools are clearly placed within a sociocultural tradition. ANT, however, has its origins in the interdisciplinary field of social studies of science and technology and does not belong under the umbrella of sociocultural theoretical approaches. Yet, although the three approaches do not share exactly the same vocabulary and metaphors, we believe that a combination of those approaches can be beneficial to our quest for a systematic solution to a concrete problem. We feel that a certain dose of interdisciplinarity and eclecticism can contribute to enriching the discussion around the topic of learning portfolios, as different approaches can complement each other. Our attempt to combine those theories can be seen as being in direct line with existing studies, such as that of Miettinen (1999), which discusses the complementarity of cultural-historical activity theory and ANT. We view the concepts of inscription and translation as being particularly relevant to a study of the portfolio. This is because the concept of portfolio is still rather ambiguous, as portfolios are developed to achieve certain goals but can be interpreted in many different ways.

Wartofsky's taxonomy is also useful to help categorize different dimensions of the artifacts that participate to the process of portfolio assessment and in the interaction between those artifacts and the process of learning within the group. In addition, concepts of internalization, appropriation, and mastery as presented by Wertsch also provide interesting insights into the role and potential of portfolio assessment in student learning activities and lifelong learning. All the three sets of concepts are useful in some ways, but all three have significant limitations that motivated us to look further. We feel that the concepts that are most relevant to our quest can be combined and we propose one way of combining them in the model presented next.

INSCRIPTION AND TRANSLATION PROCESSES IN ARTIFACTS: THE CASE OF PORTFOLIO ASSESSMENT

Using an ANT perspective, a *primary artifact* can be said to be generally *inscribed* with a certain *program of action*. If we take the example of portfolio assessment, we can identify a number of primary artifacts, that is, of tools that are used directly in production: the portfolio itself (i.e., the physical collection of assignments, either in an analogue or in a digital form) and the tools used to produce this portfolio (pen, paper, online learning environment, computer, etc.). Those tools are inscribed in a more or less rigid program of action: A pen can be used to write and to draw but can also be part of a piece of art; a sheet of paper can be used to write on but can also be used to create origami, and so on. All these primary artifacts generally undergo a process of *translation* whereby their users give them a meaning and redefine them to incorporate them into their own context. We argue that this translation process is embodied in secondary artifacts.

Secondary artifacts consist of representations of primary artifacts, in written form (e.g., the guidelines developed by the learning institution regarding the form and content of the portfolio), in "gestural" form (e.g., routines, patterns of use of the learning management system), or in

conceptual form (e.g., the students' understanding of the purpose of the course, the teachers' perspective on what should be assessed and how, the software designers' conception of what a portfolio is and how it is to be used).

In ANT terms, such secondary artifacts may be seen as participating either in the process of inscription or in the process of translation of primary artifacts. Those secondary artifacts are not only representations or *re-presentations* of primary artifacts, they also participate to their definition (*inscription*) or their redefinition, reconstruction, and reinterpretation in the mind and in the activities of the user (*translation*). For example, the designers and developers involved in the planning and modeling of a software application to support portfolio assessment need to have a definite idea of who the future users of the software are going to be, what level of digital literacy can be expected of them, and what they will use the application for. They also have a particular vision of how a portfolio should be formed, what type of elements it may or may not include, and what restrictions should be made regarding its access (who may add elements to it, who may read its content, who may modify it, etc.). All these ideas and visions are secondary artifacts used to *inscribe* a primary artifact (the software application) with particular features, properties, and programs of action. Translation is also an inherent part of portfolio development and understanding. For example, students, after having read the portfolio guidelines written by the teacher, might jot down a list of items they intend to include in their portfolio. This list is a secondary artifact, which is a translation of another secondary artifact.

Tertiary artifacts are creative and unexpected ways of thinking or using original (primary) artifacts. By definition, these deviate from the patterns of use as thought out by the designers of the primary artifacts. Those artifacts do not typically bear heavy inscription. They are almost exclusively the result of the *user's translation of the primary and secondary artifacts*. In portfolio assessment, tertiary artifacts take form in the students' or former students' modes of thinking that may have been influenced by using portfolios as an assessment method in the course of their studies. Having to build a portfolio over time may shape a person's approach to the production of texts, for instance, regarding how the work is planned, how it is performed, how official sources are used, and how references to other people's work are systematized.

For example, the practice of building a portfolio may also affect the ability of a person to envision a finished product according to a set of given assessment criteria. In many cases where portfolio assessment is used, students are asked to reflect on their own learning process and on their participation to the learning process of their fellow students. In the nursing education example previously outlined, students learn to document their clinical activities in a systematic and structured manner. One of the purposes of this is to develop work routines whereby documentation plays a central role. A situation whereby a nurse has integrated documentation of clinical activities into his or her practice could be an example of a tertiary artifact, resulting from a successful translation of both the primary and the secondary artifacts.

Mastery and Appropriation in Perspective

The concepts of mastery and appropriation seem particularly relevant to a study of the relation between students and portfolio, both the concept of portfolio assessment and the physical portfolio. When students work on their assignments for the portfolio they will sometimes do what is expected of them without appropriating the conceptual tools, world views, or the conventions connected to the way of working. The students can even master the various devices

that constitute a perfect portfolio, but this does not mean that they will ever use them in any other settings as conceptual tools. The portfolio as a way of working and learning may remain an abstract construct from which the students may be utterly detached. It is therefore necessary to see the students' mastery of the portfolio as something different from their appropriation.

The process of appropriation of the portfolio as an artifact involves students closely relating to the concept of the portfolio and making it "their own." In other words, students will have appropriated the portfolio successfully when they will have learned to integrate it into their own intentions and plans and embed it into their learning activities in a way that makes the portfolio inseparable from its context and individual learning an integral part of the collective learning process. Once students have appropriated the portfolio as a concept, they will develop clear preferences as regards to how they approach crucial activities such as learning, documentation, collaboration, and so on. On the one hand, the issue of appropriation could be explored by looking into how and to what extent students experience the portfolio as an actor and artifact that is relevant in other contexts than the activities arranged for educational purposes. On the other hand, the concept of mastery can be explored by investigating to what degree students master the portfolio as an artifact. If their mastery only translates into doing the absolute minimum to get their degree, it is legitimate to question whether portfolio assessment is a better way of assessing students than traditional forms of assessment.

THE PROPOSED CONCEPTUAL MODEL

In our model, we identify various representations of portfolios as artifacts. Those representations relate to the various activities that emerge when using portfolio assessment and we choose to classify them according to Wartofsky's categorization. We also identify the human and nonhuman actors that relate to those artifacts. In addition, we formulate hypotheses regarding the extent to which such artifacts may be mastered and appropriated by the students of portfolio-assessed studies.

We consider each of the artifacts, in the context of portfolio assessment, to be actors in ANT terms, as they are all entities that do things or that cause others to do things. Those actors can be human or nonhuman, physical or nonphysical, and they affect a variety of other actors. Students, teachers, and administrators all have to relate to the primary artifacts of the portfolio: Students build their own portfolio, teachers read elements of the portfolio and give feedback and marks, and administrators register the marks given so as to document the students' participation to the course and final results. Users of those primary artifacts may display various levels of mastery of the artifacts, and they may master some artifacts better than others (e.g., some people might feel more comfortable with working with a "physical" portfolio—that is, a physical folder containing paper documents—that with a digital portfolio). But regardless of their level of mastery, it is unlikely that they will appropriate those artifacts to a great extent, as they are little else than tools to be used to achieve other pedagogical goals.

Secondary artifacts relate both to the users and the designers of the portfolio: A first set of secondary artifacts consists of the way *designers inscribe the primary artifact* with expected patterns of use. The second set of secondary artifacts consists of the way *users*

translate the primary artifacts within the context of their specific goals, background, and values. Users and designers may master those artifacts to a greater or lesser extent, but they will probably have a closer relationship with secondary artifacts than with primary artifacts and appropriate them more easily than primary artifacts. An example of successful appropriation of the portfolio as a secondary artifact could be the way students in nursing (Example 1) relate to the portfolio guidelines provided by the teachers. As those guidelines give the students a margin of maneuver in a number of areas, those students who relate to them in a very literal manner might feel insecure about what they are supposed to do, which would reflect a low level of appropriation. In contrast, those students that have truly appropriated the guidelines as tools would allow themselves to interpret (translate) them in such a way that they feel free to color their assignments according to their own intentions and interests.

As mentioned earlier, tertiary artifacts are creative and unexpected ways of thinking or using primary artifacts and are almost exclusively the result of *users' translation* of the primary and secondary artifacts. The actors that relate to tertiary portfolio artifacts are therefore the users of the portfolio themselves, as well as the people and the institutions they relate to during and more importantly after their studies. Here again, users may have various levels of mastery of such artifacts, but they have most likely a high level of appropriation of those artifacts, which are in effect the users' own creative constructions of what portfolio assessment and "portfolio thinking" may be about. We believe that this dimension is particularly important for lifelong learning: At this level, users have so much integrated the idea of the portfolio that it has become a natural part of their daily activities, whether those are professional, learning, or personal activities. It is to be expected that those users for whom the portfolio has become a tertiary artifact have integrated the concept of self-documentation into their daily lives to the point where it will be natural for them to gather text and documents, use them to communicate with others, and update them according to the feedback given. In that sense, the portfolio might contribute to influencing the interpersonal dynamic of the workplace, if several staff members have developed a "portfolio thinking" during their studies.

This model offers an analytical conceptualization of the portfolio both as an artifact and as an actor. In a practical investigation of portfolio assessment, it will allow us to identify the various affordances and constraints that are related to its use. In addition, it can serve as a tool to build a deeper understanding of how the portfolio becomes a constitutive element of activities in a community. By differentiating explicitly between the physical and other representations of the portfolio, this model may be useful in providing an orderly classification of the various ways of conceptualizing portfolio assessment in research. In particular, this model can help identify the different meanings given to portfolio assessment in relation with its different functions.

When it comes to using this model in an empirical study, we would suggest that the degree of inscription and translation of the portfolio could be one of the main interesting areas of investigation. It can be hypothesized that inscription and translation are related to the process of appropriation and mastery among both student and teacher users of the portfolio. For example, we can imagine that a type of portfolio assessment that is presented to the users as very heavily inscribed with the goals of an external instance (e.g., management, ministerial requirements, etc.) might be difficult to appropriate and even to master. We can also imagine that portfolios that go through a significant process of translation by some of their users are more likely to be appropriated and mastered. This, however, will have to remain at the stage of hypothesis until we have gathered enough empirical data to shed light on the hypothetical link between the two

sets of concepts. In accordance to the theoretical bases of our work, we will take great care to draw specific conclusions only after having carried out a detailed mapping of the context of our findings.

CONCLUDING REMARKS

This article has presented a conceptual model that borrows elements from various theories and that aims to provide a framework for analysis of the design and the use of portfolio assessment. This framework can be used to structure the way information is gathered about how portfolio assessment is thought of, designed, implemented, and used in practice. It can also help to investigate in an orderly manner how portfolio assessment becomes an actor in the interplay between designers and users of new educational processes and how the artifacts related to portfolio assessment are translated through different representations. The framework can also help to structure the gathering of data about the internalization of the various procedures that constitute portfolio assessment and the various goals and approaches to student portfolio as a pedagogical tool. In other words, it will help uncover in a systematic fashion whether and to what extent students, teachers, and other actors involved in portfolio assessment learn to master the various functions of the portfolio and to appropriate the “idea” of the portfolio.

An interesting issue that has not been addressed in this article but that might require further investigation is that of the possible negative aspects of an excessive internalization of the portfolio concept. In particular, there is a need to examine whether an overzealous internalization of the “portfolio thinking” could lead to unreasonable demands of self-documentation and whether this can be detrimental to practice. There is also a need to reflect on the possible consequences of “overdocumentation” at the societal level and whether an exaggerated focus on documentation of practice could result in increased levels of surveillance. The conceptual model outlined in this article might be helpful in conducting research exploring such concerns as well as other issues related to the role of portfolio assessment in the various facets of learning.

It is clear that such a model can only be tentative at this stage and needs to be “tested” against the reality of practice, reappraised, and modified accordingly. Empirical research can be carried out on the basis of this model and we believe that an important part of such research will be to try and uncover elements that do not “fit” into the framework either because they contradict the underlying assumptions made while building it or because they have simply been left out. Indeed, this framework, just like any other, cannot (and is not meant to) capture the whole complexity of real life. It may be useful to the extent that it may provide keywords and a structure that can systematize the data-gathering process but should not considered to be comprehensive or complete, so as to leave room for unexpected and “dissonant” results.

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