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SELF-AUTHORSHIP CHARACTERISTICS OF LEARNERS IN THE CONTEXT OF AN INTERDISCIPLINARY CURRICULUM: EVIDENCE FROM REFLECTIONS

by

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Abstract: This article reports the results of a qualitative case study investigating the self-authorship characteristics of learners in the context of an interdisciplinary curriculum. The study identifies the students' assumptions about knowledge, self, and relationships. The findings are based on evidence from reflective essays written by students upon completion of their undergraduate courses. The findings suggest that graduates in this program have come to see interdisciplinarity as a way of both thinking and living, and have additionally developed a sense of agency over their education and future careers. In their view, engaging with broader horizons and seeing multiple perspectives are the most valuable skills acquired through their interdisciplinary education. Above all, the students perceive the responsibility they have had for their own study program as contributing to their development as self-directed learners.

Keywords*:* self-authorship, self-directed learning, interdisciplinary curriculum, reflection, dimensions of learning, sense of agency

Introduction

In a world in which rapid change is the only stable characteristic, the primary aim of education must be to develop the skills of self-directed inquiry.

This, at least, was the opinion of Malcolm Knowles in 1975. Knowles (1975), well known for his work on adult education, considered self-directed learning a basic human competence "that has suddenly become a prerequisite for living in this new world" (p. 17). Twenty years later developmental psychologist Robert Kegan (1994) similarly argued that one of the demands of modern life is that we be self-directed learners: that we "take initiative; set our own goals and standards; use experts, institutions, and other resources to pursue these goals; take responsibility for our direction and productivity in learning" (p. 303). It is suggested that both self-direction and self-determination contribute to the experience of well-being (Ryan & Deci, 2000). Educators demanding self-direction from their students are, in essence, asking them to show self-authorship. Thus, self-authorship can be seen as an important quality or attitude, one that is required if someone is to become a competent self-directed learner. In a contemporary context, self-authorship is now considered an integral component of 21st century learning outcomes and a characteristic enabling more effective citizenship in the modern world (Baxter Magolda & King, 2004). Moreover, it has been argued that interdisciplinary programs offer students an environment that stimulates the development of self-authorship (Haynes & Brown Leonard, 2010).

In order to investigate the self-authorship characteristics of students enrolled in an interdisciplinary studies major, Haynes and Brown Leonard (2010) interviewed ten students in each semester of their undergraduate experience and examined the resultant data for patterns with regard to Baxter Magolda's student development theory (explained below). Haynes and Brown Leonard concluded that seniors in this interdisciplinary program "attained a degree of maturity somewhat more advanced than was typical of college seniors" (p. 661). Apparent contributory factors to this result were—amongst others—the complexity of interdisciplinary assignments, active and inquiry-based learning, frequent self-reflection, and extensive exchange with both faculty and peers (Haynes & Brown Leonard, 2010). Being an educator in an interdisciplinary program myself, I was curious to see if similar conclusions could be drawn with regard to my own program and students. Having read numerous reflective essays students had written about their educational experience over the previous ten years, I expected that self-authorship characteristics would show up in almost every reflection, making it possible to identify the factors students perceive as contributing to self-authorship.

The context of this study is a Liberal Arts and Sciences (LAS) program with an interdisciplinary core at Utrecht University—a large Dutch research university. In accordance with the liberal education concept, the

program includes a general education requirement and a disciplinary or multidisciplinary specialization. Within the guidelines of the examination regulations and with the help of academic advisors, LAS students compose a personal study program that stays as close as possible to their academic interests and capabilities. The interdisciplinary core consists of four compulsory integrative courses in which we teach the students interdisciplinary research skills. We also require four reflective essays—collected in an ePortfolio—two in the first year, one in the second year, and one immediately before graduation. These reflective assignments have been designed to stimulate students' development and increase the potential for desirable learning outcomes. The penultimate and final reflections in particular invite students to see all their activities, both within and outside of the academy, as integrated parts of a complete undergraduate experience.

A corpus of such reflective essays supplied the foundational data through which I analyzed the maturity and self-authorship characteristics of my students at the end of their undergraduate journey and identified program characteristics that stimulate self-authorship. I hoped that the results of this case study would contribute to our knowledge of the effectiveness of interdisciplinary teaching and learning. The research questions I used are identified below, after I clarify the concepts of self-authorship and self-determination, and explain how interdisciplinary learning is intended to foster self-authorship characteristics.

Self-Authorship Theory

In the context of her theory of learning partnerships, Baxter Magolda defines self-authorship as "the capacity to internally define a coherent belief system and identity that coordinates engagement in mutual relations with the larger world" (Baxter Magolda & King, 2004, p. xxii). Drawing on Kegan (1994), she distinguishes three elements of self-authorship: cognitive maturity, integrated identity, and mature relationships. These three elements correspond to three dimensions of learning. First, there is the epistemological dimension: "how people use assumptions about the nature, limits, and certainty of knowledge to make knowledge claims" (Baxter Magolda & King, 2004, p. 9); second, the intrapersonal dimension: "how people view themselves and construct their identities" (Baxter Magolda & King, 2004, p. 9); third, the interpersonal dimension: "how people view themselves in relation to others and how they construct relationships" (Baxter Magolda & King, 2004, p. 10). Baxter Magolda (2001) contends that the three dimensions of development contribute jointly to self-authorship. In a similar

way, but independently of Kegan, drawing instead on Piaget, Freud, and Marx, the Danish psychologist and educational researcher Knud Illeris (2002) also distinguishes three dimensions of learning. According to Illeris, "[a]ll learning includes three simultaneous and integrated dimensions: a cognitive content dimension, an emotional, psychodynamic, attitudinal and motivational dimension, and a social and societal dimension" (p. 25).

In her 17-year longitudinal study of learning and development amongst young adults aged 18 to 30, Baxter Magolda (1992, 2001) found substantial evidence that self-authorship is uncommon during college. In her view, "the potential for promoting self-authorship in college far exceeds the degree to which it has been prevalent among college students, perhaps due to the need for more intentional support for what Kegan (1994) calls 'the challenging curriculum of adult life'" (Baxter Magolda & King, 2007, p. 493). In other words, educators who want to prepare their students for success in adult life could do better: "Just as learners are learning to dance in the space between authority dependence and self-authorship, educators must learn to dance in the space between guidance and empowerment" (Baxter Magolda & King, 2004, p. xxiii).

Baxter Magolda sees self-authorship as a central goal of higher education for the 21st century. In terms of the three dimensions of self-authorship, the desirable 21st century learning outcomes include:

- Cognitive maturity (epistemological dimension): viewing knowledge as contextual, or as constructed using relevant evidence in a particular context. This is a necessary ingredient for achieving other learning outcomes;
- Integrated identity (intrapersonal dimension): the ability to reflect upon, explore, and choose enduring values;
- Mature relationships (interpersonal dimension): respect for both one's own and others' particular cultures, productive collaboration to negotiate and integrate multiple perspectives and needs. (Baxter Magolda & King, 2004)

Effective citizenship—which "requires complexity in defining one's belief system, a coherent identity, and mutual relations" (Baxter Magolda & King, 2004, p. xxii)—is enabled by these combined learning outcomes.

Baxter Magolda has identified various conditions that promote self-authorship through multi-contextual analysis—college education, graduate education, employment, community and personal life—and their influence on the development of self-authorship (Baxter Magolda, 2001). She has discovered that environments promoting self-authorship operate on three assumptions that model the expectations concerning self-authorship in each dimension. First, such environments convey knowledge as both complex

and socially constructed. Complexity fosters epistemological growth, in that learners are faced with ambiguity and multiple interpretations. The second assumption is that one's identity plays a central role in constructing knowledge. Successful educators use students' current knowledge and experience as the basis for further learning. The third principle, the mutual construction of meaning, welcomes students as equal participants in knowledge construction, thus helping them to clarify their own perspectives and choices (Baxter Magolda & King, 2004).

Self-Determination Theory

In order to promote self-authorship educators need to design environments that optimize their students' development, performance, and well-being. Research guided by self-determination theory (SDT) has revealed that opportunities for self-direction enhance intrinsic motivation and well-being because they allow people a greater feeling of autonomy (Ryan & Deci, 2000). In an educational context, however, "where the freedom to be intrinsically motivated is increasingly curtailed by social pressures to do activities that are not interesting" (Ryan & Deci, 2000, p. 71), *extrinsic* motivation is equally important. SDT proposes that extrinsic motivation can vary greatly in its relative autonomy. Ryan and Deci distinguish several types of extrinsic motivation, the least autonomous of which is referred to as "externally regulated." Externally regulated behavior is that which is performed to satisfy an external demand and is therefore experienced as controlled, for example when students do their homework specifically through an adherence to parental control. A more autonomous, self-determined, or self-authored form of extrinsic motivation is "regulation through identification" (Ryan & Deci, 2000, p. 72), in which the action is accepted as personally important. This kind of motivation entails a feeling of choice. The most autonomous form of extrinsic motivation is "integrated regulation" (Ryan & Deci, 2000, p. 73), which occurs when students bring regulations into congruence with their other values and needs. Extrinsically motivated actions can become self-determined as individuals identify with their regulations. In terms of Self-Authorship Theory (SAT), these individuals demonstrate an *integrated identity*.

SDT is not the same as SAT. SDT is an approach to human motivation and personality, whereas SAT is an approach to student development. However, the common ground that is relevant for this study is the insight that learning environments supportive of autonomy and knowledge construction facilitate the development of students into self-authored persons who accept responsibility for their own education and career.

Self-Authorship and Interdisciplinarity

To create an environment that enhances autonomy, self-determination, and finally self-authorship in all three dimensions—cognitive, intrapersonal, and interpersonal—is not easy, but some environments seem to provide a "natural" context, such as one in which interdisciplinary learning takes place. Various authors confirm that interdisciplinary learning fosters self-authorship. According to Ivanitskaya, Clark, Montgomery, and Primeau (2002) "[c]onvergence of disciplines on one relevant theme promotes intellectual maturation through the analysis, comparison, and contrast of perspectives contributed by each discipline" (p. 101). Interdisciplinary learning seeks to empower students by cultivating certain traits and skills that are essential for problem-solving, decision-making, and research (Repko, 2012). Faced with real-world problems, for example, interdisciplinarians often discover that these problems are so complicated that it is impossible to know everything one needs to know to fully understand them. Students are therefore forced to cope with this complexity and thus remain open to new insights, with the attendant tolerance for ambiguity being posited as indicative of cognitive maturity (Repko, 2012). Moreover, when students collaborate in teams with partners from different disciplinary backgrounds, this interaction exhibits a tendency to strengthen their communicative competence, firstly because it requires them to comprehend and translate discipline-specific terminology, and secondly because it involves them in the process of creating common ground (Repko, 2012). Students in successful interdisciplinary projects respect each other's particular cultures, acknowledging that different points of view are necessary in order to produce new meaning (Newell, 1990).

Haynes (2004) states that interdisciplinarity "often calls on all the dimensions of learning—cognitive, interpersonal, and intrapersonal—thus helping propel learners gradually toward self-authorship" (p. 87). In her view, learning goals that are essential to successful interdisciplinary writing require self-authorship. Students in interdisciplinary projects have to (1) develop adequacy in two or more disciplines, (2) demonstrate critical thinking skills fundamental to interdisciplinary inquiry in the form of comprehension, analysis, synthesis, and evaluation, (3) reflect critically on the strengths and weaknesses of disciplinary fields, and (4) integrate disciplinary perspectives into a more comprehensive understanding (Haynes, 2004; Repko, 2012).

Applying Baxter Magolda's theory of student development (towards self-authorship) to an interdisciplinary program, Haynes and Brown Leonard

(2010) developed a framework for analyzing students' developmental understanding of interdisciplinarity. A longitudinal study in one undergraduate interdisciplinary studies program revealed that the students in this interdisciplinary program "moved from viewing their interdisciplinary education as an exciting surprise party" to "perceiving themselves as interdisciplinary mapmakers who could integrate diverse forms of knowledge to create new understandings of self and knowledge." On the senior level they discovered that the students viewed themselves as "gaining a sense of agency over [their] education and the integrative process" and conceived interdisciplinarity "as part of self and one's distinctive way of thinking." Their view of others included the insights that "disagreements with others can aid in [the] learning process" and that "teamwork is key to interdisciplinary understanding." They also thought that "interdisciplinarity depends upon disciplines," and that "disciplines are constructed, [and] may conflict with one another" (all quotes from Haynes & Brown Leonard, 2010, p. 660). Haynes and Brown Leonard's findings with respect to the development of senior level students in this particular undergraduate interdisciplinary studies program offer an appropriate framework for the interpretation of the data in the present study.

Context and Research Questions

The Program

Utrecht University is one of the few places in Europe where students have an option to attend an American-style liberal arts and sciences program in the context of a research university (as opposed to a stand-alone college). Unlike most European bachelor degree programs, where students take courses in one disciplinary field—very often to the exclusion of all others for three or more years—Liberal Arts and Sciences (LAS) offers students opportunities to explore their talents and interests in an individual study program. By stimulating connective thinking from the very beginning of their first year and making the students responsible for their own education, we try to foster the students' talent for autonomous and out-of-the-box thinking.

In accordance with the liberal education concept, every student's program combines breadth and depth. In order to fulfill the breadth requirement students have to take four general education courses, to be chosen from the University's course catalogue containing courses coordinated by other

programs. As regards depth, students have to declare a major at the end of their first year. This major is usually disciplinary or multidisciplinary and also consists of courses offered by other programs.

The third component—and the heart of every LAS program—is a set of compulsory integrative courses that have been designed to promote interdisciplinary learning. These core courses are writing intensive and address themes that span the natural sciences, the social sciences, and the humanities, such as globalization, sustainability, inequality, Europe, the rise of Asia, and discovering the Dutch, to name but a few. Two first-year core courses introduce interdisciplinary learning and connective thinking. The first of these courses invites students to develop a position concerning a real-world problem using the common ground of two or more texts. During the second (multidisciplinary) course at the end of their first year, students become acquainted with a range of disciplines and their typical ways of knowing. In the second semester of their second year, in the third core course, students are introduced to interdisciplinary research techniques. They are tasked with assuming the role of an expert in the field of their major in a small-scale interdisciplinary research project. With one or two fellow students pursuing different majors, they conduct an investigation following the interdisciplinary research process designed by Allen Repko (2012) and other members of the Association of Interdisciplinary Studies. An important learning objective of this course is that students develop a meta-perspective on their own discipline, its methodology and epistemology. The fourth and final core course is a capstone project: an interdisciplinary research project conducted by teams of two or three students following different majors. The supervisors of these projects are LAS instructors, trained in coaching students in interdisciplinary courses. They are assisted by instructors from the specific participating disciplines, whose task it is to safeguard the quality of the disciplinary grounding. The evaluation criteria of these projects are built upon a rubric that draws on the work of Boix Mansilla (et al., 2009).

The "glue" that holds everything together and brings a sense of coherence to each student's program is the electronic portfolio. It contains all relevant documents assembled as the program progresses. These documents take the form of, amongst others, papers, presentations, and evaluations, the most important artifacts being the four reflective essays already mentioned above. These reflections give instructors and academic advisors a sense of how the students think, how they make connections, and how they see their activities, both inside and outside the University, as contributing to their own personal development. Reflections provide valuable data for a case study such as

this (certainly better than questionnaires with predefined alternatives). Reflections invite students to think, taking their own time, choosing their own topics, and framing questions in their own way.

The Portfolio Assignments

In our ten-year experience with both portfolios and reflections we have learned that students benefit from guidance and instruction, giving insight into what we consider constitutes a good reflection, in particular regarding depth. This is confirmed by Landis, Scott, and Kahn (2015), who examined the role of reflections in ePortfolios. They state that "[s]tudents need guidance on collecting and reflecting on artifacts, along with feedback and support to help them see the value of ePortfolio development" (p. 108). Therefore, we designed four reflection assignments containing common questions and prompts. These questions and prompts suggest to students not only what we expect them to reflect upon, but also how to achieve depth in their narrative. We also designed rubrics for the evaluation of the reflections, which are shared with the students. Finally, and in addition to the above, we offer reflection workshops in the first year.

The questions and evaluation criteria relate to the program's learning outcomes, which, for this purpose, have been clustered in four (partly overlapping) categories: disciplinary knowledge, research skills, interdisciplinary competencies, and professional attitude. In their final reflections we ask students to explain how LAS has contributed to their academic and personal development. We also suggest that they contextualize their specialization (major) and make connections between their major and other disciplines. Furthermore, reflection on interdisciplinary competencies is required. Finally, we suggest that they reflect on their personal development by looking back at earlier reflections. We explicitly ask them to write about collaboration and the impact of extracurricular activities, because we know that students learn from all sources both in and beyond the classroom, the so-called *lived* curriculum (Landis, Scott, & Kahn, 2015).

LAS faculty and academic advisers evaluate the reflections and provide feedback (formative assessment). Two experienced LAS faculty members evaluate each of the final reflections. Students receive credit for completing the assignment in a satisfactory—i.e. non superficial—way, but no grade. Although most students do not particularly like to write reflections, they do it reasonably well. In their senior year they even seem to start appreciating the activity itself, having learned that reflection is in itself a significant learning experience that contributes to their development. The students demonstrate

a form of extrinsic motivation that Ryan and Deci (2000) might refer to as "regulation through identification" (p. 72).

Research Questions

In light of the foregoing we believe that ePortfolios and the reflection assignments in particular can be used both to assess and promote our students' development and to increase the likelihood that they will achieve the program's intended learning outcomes. Previous to this study, however, we did not analyze and interpret the reflections in the context of SAT or SDT. In order that we might do so now, the following research questions guided the study:

1. What evidence of self-authorship do LAS students show in their reflective essays at the end of their undergraduate journey?
2. Which program characteristics do these students identify as stimulating self-authorship?

Though the questions and prompts in the reflection assignments were designed to promote students' reflection about their development, they were not framed with SAT or SDT in mind. We did frame them, however, with an eye to the program's interdisciplinary learning goals, and if interdisciplinary learning goals require self-authorship (Haynes, 2004; Ivanitskaya, Clark, Montgomery, & Primeau, 2002), SAT may very well be used as a framework for the interpretation of the data. Further, SDT will prove to be useful in answering the second research question.

Method

Data Collection

Data were collected from the final reflections of the 45 students graduating in the summer of 2013 who gave permission (informed consent) to use their ePortfolio for this project. "Participation" was, of course, voluntary and the graduates were not offered incentives to encourage their permission. I wanted to include graduates with a range of academic interests, but belonging to more or less the same cohort, because the reflective assignments as well as the content of our interdisciplinary core courses have changed over the years. At the time, the participants—12 of them male, 33 female, and all of them born between 1990 and 1992—were seniors majoring in a wide range of disciplines belonging to the humanities, sciences, and social sciences.

Obviously, this way of sampling has some limitations. First of all, self-authorship theory is largely a theory about student *development,* whereas the data collected for this study reflect the final stage of this development. In that regard, Carolyn Haynes' observations about "the end of the undergraduate journey" were very helpful as a frame of reference (Haynes & Brown Leonard, 2010, pp. 656-659). However, student development is not completely absent from the data because the seniors often draw conclusions about their own development looking back at their own earlier reflections.

A second limitation is that students who enter the University as a Liberal Arts and Sciences student are already relatively independent and self-authored persons. Thus, if they demonstrate self-authorship in their final reflections, this may not only be the result of their undergraduate education, but may also mirror an innate character trait. Still, we assume that an independent and adventurous attitude, which is common (in various degrees) to all our first year students, does not automatically lead to the understanding of interdisciplinarity as part of one's own distinctive way of thinking, identified by Haynes and Brown Leonard (2010) as evidence of self-authorship in an interdisciplinary curriculum. Moreover, an initial sense of self-authorship in a first year student may very easily be unlearned in a different curriculum that does not promote autonomous thinking.

Procedures

Based on my understanding of the literature on self-authorship and self-determination I deductively established a small initial code framework. This framework grew and changed inductively during analysis. In the last phase of analysis, I categorized the references according to the three elements of self-authorship identified by Baxter Magolda, namely, cognitive maturity, integrated identity, and mature relationships (Baxter Magolda & King, 2004). As my primary focus was self-authorship characteristics *in an interdisciplinary context*, I used Haynes' framework as outlined above and analyzed the data with students' understanding of interdisciplinarity in mind. Thus, following Haynes and Brown Leonard (2010), "cognitive maturity" in this study refers to a student's view of interdisciplinarity; "integrated identity" denotes the student's view of self; and "mature relationships" applies to the student's view of others, especially related to interdisciplinary teamwork.

The analysis (with the help of NVivo) resulted in the collection of 365 references with an average length of 150 words. Eleven reflections contained

fewer than 5 references, 22 reflections had between 6 and 10 references, and 12 reflections contained between 10 and 20 references. In my opinion, self-authorship characteristics were indeed evident in all 45 reflections, be it not always in all three dimensions and in the same way.

Findings

The following sections analyze and interpret LAS students' reflections on their own development with respect to the program's interdisciplinary learning objectives. The findings have been organized according to the three dimensions of self-authorship applied to interdisciplinarity as identified by Haynes and Brown Leonard (2010). The analysis intends to make clear how the students demonstrate self-authorship (first research question). The second section (on integrated identity) also reveals which characteristics of the LAS program the students identify as stimulating self-authorship (second research question). Table 1 summarizes the findings, highlighting the various topics that occur in the reflective essays under consideration.

TABLE 1
Evidence of self-authorship in an interdisciplinary context

1. Cognitive maturity: student's view of interdisciplinarity		
The value of multiple perspectives (25)	Interdisciplinarity is a creative process, encompassing more than one discipline, requiring out-of-the-box thinking and perspective taking.	*Framework Haynes & Brown Leonard, 2010, p. 660:* "Interdisciplinarity depends upon disciplines."
Ways of knowing (6)	Disciplines are constructed and their insights may conflict with one another; disciplines speak their own language.	"Disciplines are constructed, may conflict with one another." "Interdisciplinarity is a process, encompassing greater number of disciplines, fields."
Application of interdisciplinary skills (5)	An interdisciplinary way of thinking can be applied in other situations both inside and outside the academy.	

2. Integrated identity: student's view of self		
Interdisciplinarity as a way of thinking (32) **Sense of agency over one's education** o **Extracurricular activities (21)** o **Encountering other cultures (6)** o **Composing one's own curriculum (32)**	Seeing the bigger picture and perspective taking are the most valuable skills acquired during their interdisciplinary education Extracurricular activities increase confidence and contribute to self-knowledge. Encountering other cultures fosters openness and reflection on values. Responsibility for one's own study program contributes to one's development as a self-directed learner more than anything else.	*Framework Haynes & Brown Leonard, 2010, p. 660:* "Interdisciplinarity is conceived as part of self and one's distinctive way of thinking." "Gaining a sense of agency over education and the integrative process."
3. Mature relationships: student's view of others		
Team roles (9) **The added value of interdisciplinary teamwork (6)** **Communication and commitment (10)**	Team members need to recognize each others' qualities and be aware of their own role. Leadership involves understanding the perspectives of others. Teamwork stimulates out-of-the-box thinking. Successful teamwork requires both skills and commitment.	*Framework Haynes & Brown Leonard, 2010, p. 660:* "Disagreements with others can aid in learning process." "Teamwork is key to interdisciplinary understanding."

All reflections were written in Dutch at the end of the students' undergraduate study phase (senior level). While translating the quotes into English I have tried to stay as close as possible to the original Dutch wordings, which may explain the awkwardness of some expressions. In order to preserve the anonymity of the participants their names (but not their gender) have been altered. Majors are added when considered relevant.

1. Cognitive Maturity: Student's View of Interdisciplinarity

Students demonstrate their interdisciplinary awareness in various ways. In the reflections used for this study I identified three main topics:

- *The value of multiple disciplinary perspectives* (25 sources). Students assess relevant disciplines from a meta-perspective to demonstrate holistic thinking.
- *Ways of knowing* (6 sources). Students evaluate different ways of knowing used in different disciplines and compare the epistemology and research methods of their major discipline with those of other fields.
- *Application of interdisciplinary skills* (5 sources). Students show how they use their interdisciplinary skills in other contexts.

The Value of Multiple Perspectives

In our approach to interdisciplinarity we adopt the so-called "integrationist" position (Repko, 2012), teaching the students that integration of disciplinary insights is the hallmark of "true" interdisciplinarity. Therefore, we stimulate the students to compare and contrast disciplinary perspectives in all the reflection assignments. Also, students are supposed to demonstrate holistic thinking by considering their major discipline and other disciplines from a meta-perspective.

Taking courses in various disciplines across the University makes the students aware of relevant perspectival differences and similarities. Student Fred shows how this works:

> It is difficult, if not impossible for a student in Liberal Arts and Sciences to not come into contact with a wide range of disciplines, research methods and perspectives. By taking courses that range from an Introduction to Islam to Earth Sciences, from Philosophy of Education to Russian History or Management of Organizations, you acquire an overarching perspective. You can see differences, qualities and shortcomings in research areas and methods and you know how to use this knowledge.

The same student also acknowledges the contribution of his interdisciplinary capstone team project to his ability to take a meta-perspective: "Especially by collaborating in a capstone project with a LAS student with another major you acquire skills in achieving a meta-perspective. You learn to transcend the perspective you are most familiar with and make connections on a higher level." Six other students make similar observations about the learning

outcomes of the interdisciplinary courses. However, holistic thinking is easier for some students than for others. For example, Esther, majoring in Environmental Studies, found it interesting that "there was much discussion [among the team members] about what were the most important insights in our thesis, because in the beginning each of us reasoned from her own disciplinary perspective." Annabel, a Development Studies major, also admits that it took some time before she was able to change perspectives, a necessary step in the process of integration:

> At the end of the [interdisciplinary research] process, when writing about the common ground and more comprehensive understanding, I noticed that I no longer thought only from the perspective of my own discipline. . . . I had not experienced this process in my 2nd year interdisciplinary project. In that project I stayed too much in my own discipline.

Joyce, majoring in Cognitive Psychology, thinks that her interdisciplinary capstone project, in which she and her partner created "an imaginary bridge where you can bring the insights from both disciplines together," made her more flexible in her thinking.

These students show how their interdisciplinary education has made them aware of the role of disciplines in interdisciplinary projects and of the importance of interdisciplinary integration.

Five students indicate that their broad interdisciplinary education also has made them look at their major from a meta-perspective. For example, Derek, a Sociology major, experienced that "[y]ou do not simply attend the courses [of your major], but you reflect on the question of what it is that sociology really is investigating? And how they do that? And how is that different from other disciplines?" Inge became more critical with respect to her own specialization. Comparing her major, Communication Studies, with other fields, she missed a critical view on research methods:

> Their use is often left implicit. . . . This also means that they are never questioned, whereas to my mind that could lead to new insights. . . .The meta-perspective that is present in Comparative Literature Studies and especially Gender Studies is lacking in Communication Studies.

Stan goes even further when he admits that with his growing knowledge of disciplinary perspectives his appreciation of science(s) in general declined, yet conversely, he writes, "My interest in science increased and I developed my own ideas on epistemology and methods."

Thus, by attending courses in different departments and through contact with other LAS students in the interdisciplinary core courses, most students

have learned that interdisciplinarity depends on disciplines but requires both situated and holistic thinking. They see interdisciplinarity as a creative process, encompassing more than one discipline, requiring out-of-the-box thinking and perspective taking. Their reflections make clear that changing perspectives and integrating insights are among the most challenging, but also the most rewarding aspects of interdisciplinary research.

Ways of Knowing

Some students demonstrate holistic thinking by trying to *explain* the differences between disciplinary perspectives. Thus, Stan, an honors student majoring in the History of International Relations, reflects on the question why some disciplines use theories and other disciplines do not:

> Theories simplify reality; they often make a model of it. For a historian who is trying to understand interpersonal reality in all its complexity. . . theories are useless. On the other hand, for a social scientist that wants to explain, theories are very important, because only by abstraction and generalization can overall explanatory mechanisms be found.

Lisa, also majoring in the History of International Relations, has learned that in the 21st century theories are less relevant, because in her view "globalization is changing the world so fundamentally that it is difficult to link contemporary international events to meta-theories."

Roger, majoring in Cognitive Psychology, reflects on the position of the researcher in this field, trying to combine what he sees as the best elements of different disciplinary worlds:

> The social sciences and humanities increasingly emphasize the constructivist nature of truth. . . . On the other hand, in my own field, but also in, for example, sociology and social psychology, there is a strong emphasis on positive falsifiable knowledge. . . . Cognitive psychologists tend to forget that they study people and that the processes that influence our research subjects equally affect us.

Students are aware that different disciplinary ways of knowing may lead to conflicting insights that can nonetheless be brought together in a more comprehensive view. For example, in his capstone project Derek learned that "the economist may argue that the introduction of microcredit creates an increase in income and an increase in prosperity, whereas the sociologist sees that social welfare is diminishing on a macro level." Michael knows that integrating conflicting insights requires a common ground:

> I have learned that it is important to not just combine the insights from different perspectives with each other, because each has its own paradigm and its own basic knowledge. . . . I have learned that it is important, when doing research, to make disciplinary insights compatible with each other by creating a 'common language' first.

Naomi summarizes these findings very well when she writes, "An interdisciplinary perspective on complex problems does not only mean a more comprehensive look, but also creates a certain awareness of the frameworks in which research is conducted." Approximately 15% of our students demonstrate this kind of awareness.

Application of Interdisciplinary Skills

In the course of their undergraduate journey students learn to appreciate and use the interdisciplinary skills they acquire. Two students with multidisciplinary majors explicitly report that they applied those skills in their major. Thus, Anna, an Artificial Intelligence major, writes that she became "much better in establishing connections and integrating insights," which in her experience gives her an advantage compared to the "regular" Artificial Intelligence students. In a research project in her major she integrated insights from philosophy, psychology, and logic by using the interdisciplinary technique of organization: "Philosophy generates ideas that are tested against reality by psychology, and logic makes an abstract model of it." Doris reflects on the interdisciplinary aspects of her major, New Media and Digital Culture. She suggests that for a field that is so interwoven with our daily actions as new media, it is very valuable to approach issues—e.g. the changing meaning of the concept of privacy—from different perspectives.

Other students indicate how they expect to use their interdisciplinary skills in their future careers. Eliza, majoring in Communication Studies, suggests,

> You cannot just concentrate on your own job during your working life. You need a different, further perspective to look at the bigger picture: the goal that you and your colleagues aim at, the shared horizon. The interdisciplinary projects have taught me how to address complex issues.

Arthur, preparing for medical school, thinks that he will benefit from an interdisciplinary approach in his future practice "by calling upon the help of another specialist" or "by enlisting the help of an ethicist in developing a research proposal."

Clearly, these students are "beginning to form their own understanding of interdisciplinarity" (Haynes & Brown Leonard, 2010, p. 660). They think

they have developed a broad overview on disciplines in general and on their own major in particular. Seeing the bigger picture is something they value most: It distinguishes them from other—monodisciplinary—students they meet during their courses. Although they have learned that disciplines are constructs and may conflict with one another, they are aware that interdisciplinarity depends upon disciplines. Students with multidisciplinary majors report that they apply their interdisciplinary skills in their major whilst others report they expect to use them in their future careers. They are beginning to show signs of an integrated identity, more evidence of which will be presented below.

2. Integrated Identity: Student's View of Self

An integrated identity, according to Haynes and Brown Leonard, is evidenced when students conceive interdisciplinarity as part of their "distinctive way of thinking," and claim "a sense of agency [in their] education and the integrative process" (2010, p. 660). Haynes and Brown Leonard's analysis suggests that an interdisciplinary education contributes to this sense of agency. As contributing factors they mention (among other things) the complexity of the interdisciplinary course material and assignments that encourage students to wrestle with ambiguity and to actively engage with the topics and inquiry-based learning (Haynes & Brown Leonard, 2010). The findings below point at other (additional) factors identified by LAS students as contributing to their development as self-directed learners. Notably, it is not always easy for them to explain what they have learned where; however, this may simply be the hallmark of an "integrated identity" and a "lived curriculum" (Landis, Scott, & Kahn, 2015).

Interdisciplinarity as a Way of Thinking

One of the prompts of the final reflection assignment invites students to reflect on the consequences of their choices inside and outside the academy, and to write about their future plans. For 32 students this was an invitation to write about their values or passions. Eight students explicitly made the connection between their values and their interdisciplinary education. For example, Steven writes,

> I believe I can be a bridge-builder between different disciplines. I have an economics background while I feel that my heart is not in stock prices and bonuses. It seems challenging to use my economic knowledge to make the world a little bit better.

Claire, an Environmental Studies major, thinks that LAS has made her "deal more consciously with choices, become more independent, more open and more social and more able to think from the perspective of 'the other'." She expects that, due to her interdisciplinary education, she will "remain critical and daring to think beyond disciplinary boundaries." Referring to his disciplinary bachelor's research project, honors student Stan writes,

> I do not want to build a fortress again. . . . That is not an argument against academic rigor or the potential utility of specialized work. It is a statement of personal preference—and at most an argument against academic isolation.

Dreaming about her future, Iris, majoring in Education Science, sees herself working in an international organization where she can contribute to educational improvements on an international level. She thinks that she can make a difference because she can tell when expertise from outside is needed and knows how to get it: "I would look at the problem from a helicopter perspective and together with my colleagues come up with a plan to solve the problem." These students clearly conceive of interdisciplinarity as part of their identity and their way of thinking.

The most interesting texts give us a sense of how students connect the three dimensions of learning while reflecting on their personal development and future career. Fleur, for example, thinks she will use her interdisciplinary skills in contexts where she will have to work in projects. She writes,

> I think I will benefit greatly from the integration techniques I learned at LAS. It will help me to grasp the essence of a conflict. By taking into account my own core values I can make sure that in negotiations (at work, in personal relationships) I do not go beyond my own limits. For this it is necessary that I am aware of those values. I will continue to reflect.

Anna thinks that over the years she has developed strengths such as "working independently, working together, coming up with creative ideas, seeing connections and thinking about the bigger picture." And Eliza believes that the way of thinking she acquired in the interdisciplinary courses will help her in her life "to be curious about other disciplines." She also believes that "to see connections is very important, because . . . to move forward with all the knowledge that people have, you should be able to combine, connect and apply." Finally, the most impressive evidence of an interdisciplinary way of thinking comes from Yvonne, who in her interdisciplinary education learned that

> there are many perspectives needed to understand certain aspects of events or situations. In the summer of 2013 I went to Egypt

> for an internship, where I have subsequently investigated the revolution. It has become clear to me . . . that values do not count when the majority of the population is below the poverty line. In Egypt people have been so long deceived by their government, suppressed by the army and the police, that the line between good and evil is not clear to many. I have learned that I should not take our situation as a starting point when I look at others and judge them. The reality is different; we have never had to make choices that affect our morality.

The students consider seeing the bigger picture and perspective taking as the most valuable skills they have acquired in their interdisciplinary education.

Sense of Agency over One's Education

Students identify several factors as contributing to their sense of agency over their education and their lives in general. Extracurricular activities (work, internships, volunteering) are perceived as the most important factors. Almost 50% of the students (21 sources) think that they learned from these activities as much as or even more than from their studies. Encountering other cultures, in other disciplines or while traveling, is another factor (6 sources), and 32 students think that composing one's own curriculum also has contributed to their development as self-directed learners.

Extracurricular activities

Most students combine their studies with work and other extracurricular activities like sports or volunteering. They learn many things and do not always find it easy to identify what they have learned where. Steven, an Economics major, is aware of this when he writes,

> It is hard to say where I learned the most and what exactly I did learn. I think you are going through a development in all the places you are in, and that you are formed by the combination of your activities.

His studies gave him a "better understanding of the world" and in his work he saw how theory becomes practice, while in his student union activities he thinks he developed self-knowledge and learned to reflect on his behavior.

The added value of extracurricular activities, and especially volunteering, is stressed by 21 students. In their view, many students apply their

interdisciplinary skills, especially collaboration and communication, in these activities, but over a much longer period than they do in a single interdisciplinary course. As a result, they feel that the extracurricular experience has more impact on their development than what they learn at university, additionally developing other aspects of their personality. Thus, Milou tells us how her many extracurricular activities have contributed to her sense of agency:

> I have grown not only as a student but also as a journalist, teacher, producer and director, but above all as a critical thinker and independent and enterprising individual. Through all that learning I have gained a lot of confidence and discovered that maybe I can make a difference in the world.

When reflecting on these activities, some of them also demonstrate out-of-the-box thinking. For example, Eliza writes, "Outside the University I worked as a volunteer at a number of events. Working there it became clear how important it is to look beyond your own role and see what you can do for the bigger picture." The common ground of the students' reflections on the value of extracurricular work seems to be that they feel it gives them more confidence and self-knowledge.

Encountering other cultures

Traveling around the world and encountering other cultures can have a big impact on a student's development. Sandra spent some time traveling in the Far East. "These trips have taught me many things," she writes, "seeing things in perspective, having patience, to respect and accept, to name a few." The travels also helped her to move forward with her major in Environmental Sciences because "the world is so beautiful, and I want to contribute something to its preservation." And Yvonne thinks that her travels have changed her view on people and cultures:

> One of the aspects that stood out the most was that people anywhere in the world aspire to the same goal, namely: happiness for themselves and their children. . . . [Travel] has taught me to look differently at people who behave differently than we do. Thus, it is difficult for us to imagine that people can forget their values and behave in a criminal way. If we realize that everybody's greatest goal in life is to be happy, then we can understand that criminal behavior stems from this, and that these people apparently need it more than we do.

Of course, students do not need to travel in order to reflect on values. Milou took an Anthropology course that made her realize that, "by learning about foreign cultures I develop more understanding and compassion for other people and I think more often about how more equality could arise among people."

Contact with people from other cultures or disciplines makes students think about differences and similarities, and forces them to reflect on their own values. Lotte, a History major, noticed a discrepancy between her own values and those of the "regular" History majors she met in her classes: "The usefulness of historical research seems irrelevant to the historians I meet. However, my study is largely paid from tax money, so I want to justify that I investigate historical phenomena." And Naomi thinks that the social contacts she has had during her college years have been even more valuable for her personal development than her studies, because through these contacts she has learned "to be much more open to new things and people, but also to step outside my comfort zone and adapt quickly to new situations."

Few students see this openness as a result of their interdisciplinary education. However, for us as educators it is obvious that the receptivity to other perspectives and the appreciation of diversity the students display in their reflections are typical traits of interdisciplinarians (Repko, 2012).

Composing one's own curriculum

In all four reflection assignments we encourage students to reflect on the choices they make in composing their curriculum. Thinking about choices and possibilities appears to stimulate reflection on strengths and weaknesses and on what a person really wants in his or her life. In the final reflections used in this study, 32 students indicate that thinking about choices and actually experiencing the consequences have made them self-directed learners. Six of them reflect on the added value of composing one's own curriculum. For example, Claire writes,

> In my three years with LAS I have learned to work independently. This began in the first semester of my first year when I had to choose right away all my courses independently. In addition, I had to get used to another group of students each semester. As a result I am now able to independently organize the things I want to accomplish. In addition, I have learned to operate in different social situations in an unfamiliar group of people. I have thus become socially competent, independent and purposeful. It is nice to know that if you really want something, in many cases, it is possible.

Lisa claims that composing her own study program encouraged her to think about her future as a person and as an academic: "Every time I had to make a choice, I thought about what I think is important and what I want to achieve with my studies." This can also be seen in Naomi's reflection. She explicitly ascribes her academic and personal development to her interdisciplinary education as well as to the fact that she composed her own curriculum:

> My study has made me a broad but also disciplinarily trained academic who can look across borders and has a clear awareness of her own bias. Moreover, the freedom in putting together my curriculum caused me to make conscious choices and to reflect on my development not only as a scholar but also as a person. Because you are forced to be busy with the composition of your study program and to reflect on your progress, the question of what you want to achieve does not stop at gaining credits.

Obviously, the idea of composing one's own curriculum attracts students with a certain inclination towards autonomy, but several students indicate that they had to learn how to deal with the responsibility that comes with this freedom. Esther reports that the fact that "a lot of things you have to figure out yourself, because there is no one to do it for you" made her both more aware of her responsibility and more emancipated. And Jessica, who completed two majors in three years, thinks that the challenges of composing a very complex study schedule made her a self-directed learner: "I dared, and I did it while some have discouraged me. This shows that I know how to choose my own direction." Some students mention the stress caused by the choices they had to make. For example, considering all the choices she had to make, in her studies as well as in her life as a sportswoman, Joyce says that she has learned "to deal with stress and adversity." She also thinks that the combination of activities and the constant reflection on her priorities taught her "self-discipline and purposefulness." These students not only express that they have gained a strong sense of agency over their education and their future; they also indicate that the responsibility they had for their own study program contributed to their development as self-directed learners.

3. Mature Relationships: Student's View of Others

Evidence of how students think about their relationships with other students can be gathered from the reflections on collaboration and

communication in both interdisciplinary and other group projects. Three themes can be distinguished: team roles (9 sources), the added value of teamwork (6 sources), and the required commitment of team members (10 sources).

Team Roles

In interdisciplinary teamwork it is important for the team members to recognize each other's qualities and expertise. That this can be learned by experience is evident from Caroline's reflection. Looking back on her earlier projects, she writes, "I used to do everything myself, but now I have learned to recognize people's qualities and to use them in a good way. Everyone does what he or she does best." Students express that successful collaboration also requires that the collaborating partners be aware of their own role in the team. For example, Judith states,

> It is important that you know what . . . role works best for you. In the beginning of my studies, I never thought about a group assignment in this way and never considered what my specific contribution could be as a team player.

Mary also expresses a development towards self-authorship in her reflection on collaboration:

> With regard to collaboration I have seen an improvement in myself. In my first year I was much more inclined to follow the opinions of my peers, whereas in the past year I have attached more value to my own ideas and initiatives.

In the context of team roles, the concept of leadership occurs quite naturally. Some of our students think of themselves as natural leaders but Lotte, apparently, has learned assuming leadership can be problematical:

> The leadership role suits me, but can also be a trap. I have noticed that people do not always appreciate when I take that role, so I have learned to be patient and tactical when I want something different from the rest.

Doris had a similar experience:

> I learned that I like to take a leading role and make decisions quickly and easily, but I also learned that I might listen to the opinion of others more often. In retrospect it would have been better if I had had this insight slightly earlier.

Her high expectations of others made collaboration difficult for her. Irene expresses a very mature view on good leadership when she writes,

> If you want to be a good leader, it is important to be aware of your own values first. Then, bridges can be built and you become aware of the environment. Being able to read the context, being aware of your surroundings, understanding the perspectives of others and responding to them, as it were, "speaking the language" of others within a group. I call this a good leadership.

And finally, Stan observes that "one's team role may change based on team roles of the other team members."

The Added Value of Interdisciplinary Teamwork

Six students explicitly mention the added value of interdisciplinary teamwork. For example, Joyce, majoring in Cognitive Psychology, experienced that thinking out-of-the box is easier in a collaborative setting:

> By working together with someone from another discipline (sociology) I noticed that it is easier to think outside the boundaries of your own discipline. We were able to complement each other with our specialist knowledge, and we could, especially in the creative process, make sure we both looked beyond our own knowledge. . . . I found it very nice to see how you were encouraged to think outside the hard facts and information in this process.

Esther thinks that working in a group made her think more critically about her own contribution: "Discussions about your work can be very instructive, because you are forced to think carefully about what you have done." And Lisa discovered that "by communicating well with each other . . . we could compensate each other's weaknesses and use our own disciplinary skills."

Communication and Commitment

All students recognize that good teamwork is essential in interdisciplinary projects, but they do not all particularly like to work in a team. However, with the exception of one student who admits that she finds collaboration mostly frustrating, all students think that it is a useful skill that they have acquired in their interdisciplinary projects. Negative comments refer to failure to meet deadlines and time-consuming discussions about scope and aim of the research project. However, an important insight comes from Ben, who has experienced that teams are successful when their members are equally committed: "The cooperation was good, mainly because we were on a par in terms of communication and commitment. When that

balance is there, you can achieve wonderful things with people you barely know."

Discussion and Conclusion

The study described in this article shows how students attending the interdisciplinary Liberal Arts and Sciences program at Utrecht University demonstrate self-authorship at the end of their undergraduate journey. Self-authorship is the "capacity to internally define a coherent belief system and identity that coordinates engagement in mutual relations with the larger world" (Baxter Magolda & King, 2004, p. xxii) and includes taking initiative, setting one's own goals, and taking responsibility for one's direction in learning. It is an attitude that is considered an important 21st century learning outcome enabling effective citizenship. It can be enhanced by an interdisciplinary learning environment, because the learning goals that are essential to successful interdisciplinarity require self-authorship—they call on all dimensions of learning: cognitive, interpersonal, and intrapersonal (Haynes, 2004).

Referring to these three dimensions of learning, the first research question of this study was: What evidence of self-authorship do LAS students show in their reflective essays at the end of their undergraduate journey? In order to answer this question I have tried to identify the students' assumptions about knowledge (their view of interdisciplinarity), values (their view of self), and relationships (their view of others) as expressed in their reflective essays. The findings presented above suggest that in the cognitive dimension—that of students' view of interdisciplinarity—the students' most important insight is that interdisciplinarity results in a meta-perspective on one's own and other disciplines. By comparing and contrasting disciplines and their perspectives students come to realize that disciplines are constructed and that disciplinary insights may conflict with one another, but also that conflicts can be resolved by creating a common ground. In their interdisciplinary projects they have learned that interdisciplinarity involves perspective taking and stepping outside of one's comfort zone. Regarding the second dimension, that of students' view of self, many students indicate that for them interdisciplinarity has become a way of living. We have seen that they also apply perspective taking in life outside the academy. Students reflect socially and ethically on their own place in society, now and in their future careers. With respect to the third dimension, namely that of students' view of others, the findings suggest that students have experienced that collaboration and good communication

are essential to successful interdisciplinary projects. Many of them also apply these skills in other contexts both inside and outside of the academy. Students reflecting on their role in research teams very often come to the conclusion that this very capacity—reflecting on roles—is something they have acquired in the interdisciplinary projects. Many of them think they are natural leaders, but they have learned that leadership involves understanding the perspectives of others. So far, these findings are congruent with Haynes and Brown Leonard's insights in their study on student development in their interdisciplinary studies program (Haynes & Brown Leonard, 2010).

Another recurring theme in the reflections examined in the study is the agency students feel they have over their own education. They have set their own goals and taken initiative and responsibility for their own learning direction, thereby showing evidence of self-authorship in the second dimension. According to Haynes and Brown Leonard (2010) this "increasing mastery over his or her perspective or life" (p. 656) may be an effect of the student's interdisciplinary education—in their case, of the fourth-year (year-long) senior capstone assignment. The findings in this study, however, suggest that our students are more inclined to ascribe their increasing sense of agency to other program characteristics besides interdisciplinarity.

This brings us to the second research question in this study: Which program characteristics do these students identify as stimulating self-authorship? The reflections reveal that most students appreciate their interdisciplinary education mainly because of the openness of mind they have been able to cultivate. It certainly stimulates self-authorship in all three dimensions. Yvonne summarizes this idea very well when she writes, "My role as an interdisciplinarian in the future lies in opening the entrenched ideas that most of us have. As an interdisciplinarian I can show that looking from different angles yields more understanding and creates more openness." The findings above, however, also suggest that our students appreciate LAS primarily because of the freedom it offers them to compose their own study program—a conclusion supported by curriculum evaluations. Composing their own curriculum has made them, in their own view, self-directed learners. In terms of self-determination theory (Ryan & Deci, 2000), LAS students demonstrate an autonomous, or self-determined, form of extrinsic motivation. It means that they accept certain choices (e.g., taking certain courses, performing certain extracurricular activities) as personally important and congruent with their values and needs.

Reflecting on the above findings I conclude that various program characteristics reinforce one another. The development of the students in this interdisciplinary program appears to be supported by two factors: the

complexity of the interdisciplinary projects, tackled in collaboration with one another, and the responsibility the students have for their own education. The complexity of the interdisciplinary projects results in openness to other perspectives, seeing the bigger picture, and appreciation of each other's qualities. The responsibility for their own education leads to an increasing sense of agency and autonomy. Both factors require self-reflection. Self-authorship appears to flourish in a context where self-reflection is stimulated.

Limitations

These observations and interpretations are based on the reflections of one class of students graduating in one academic year (2013). As has been explained above, the reason for this mode of sampling was to avoid the influence of the potentially different ways in which the students were instructed in writing reflections over the years. Also, the ways in which we have taught interdisciplinary research have been subject to alterations. The students in this sample all received comparable instruction.

Another, and more important limitation is that the data analysis was conducted by only one coder, myself. In an attempt to mitigate the effects of this limitation, and to allow readers to draw informed conclusions with regard to my own understanding of the data, I included numerous quotations.

Directions for the Future

If and how well students succeed in achieving the intended learning outcomes in higher education is usually judged by the quality of the bachelor theses and, in the case of LAS, also of the interdisciplinary capstone projects. Since they are assessed using validated criteria based on the work of interdisciplinary expert Boix Mansilla and her colleagues (2009), we trust that the evaluation of these capstone projects provides evidence of interdisciplinary learning. However, it is much harder to objectively assess attitudes such as self-authorship. When self-authorship—defined as the capacity to internally define a coherent belief system and identity that coordinates engagement in mutual relations with the larger world—is to be an intended learning outcome in the 21st century, we need instruments that give us insights into how students acquire this capacity and to what extent they have done so. Whilst reflective portfolios can very well be used for that purpose, the further development of validated criteria deserves exploration in further studies.

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