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Published in:
Sustainability

DOI:
[10.3390/su70810554](https://doi.org/10.3390/su70810554)

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):

Gardiner, S., & Rieckmann, M. (2015). Pedagogies of preparedness: Use of reflective journals in the operationalisation and development of anticipatory competence. *Sustainability*, 7(8), 10554-10575.
<https://doi.org/10.3390/su70810554>

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Article

Pedagogies of Preparedness: Use of Reflective Journals in the Operationalisation and Development of Anticipatory Competence

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Academic Editor: Armin Lude

Received: 8 May 2015 / Accepted: 30 July 2015 / Published: 7 August 2015

Abstract: In higher education there is a growing demand for graduates with the competence to transform our society toward a sustainable future. Part of this competence in sustainability is anticipatory competence, the ability to engage with multiple futures, manage uncertainty and hold a worldview that the future can and should be steered toward a more just sustainable path. In order to further examine and operationalise anticipatory competence, a course “Sustainability and the Future” was developed and run in the University of Vechta, Germany, as part of an action research cycle exploring key competencies for sustainability in higher education. Reflective journaling was used to explore the competence acquisition process along with focus groups with students after the course. The analysis of this programme shows that while certain subject areas such as values, transport and population models provoke more critical reflection on the future, skills such as the ability to work with emotional aspects of the future, for instance hope, were perceived to be necessary for anticipatory competence.

Keywords: education for sustainable development; higher education; sustainability competence; anticipatory competence; reflective learning

1. Introduction

Wicked problems, such as climate change and soil erosion, keep getting worse every day—with multiples causes, many stakeholders desperately involved and defying technical fixes [1,2]. Institutions of higher education have been called upon to develop sustainability competence in their graduates in response to these problems and their complexity [3–5]. Part of this competence in sustainability is *anticipatory competence* [6,7], the ability to engage with multiple futures, manage uncertainty and hold a worldview that the future can and should be steered toward a more just sustainable path.

The Brundtland report “Our Common Future” [8] defines sustainable development as “meeting the needs of society without compromising the ability of future generations to meet their own needs”. In order to prepare for this sustainable society we must be able to imagine this future where all needs are being met, and find ways to build toward this vision while avoiding other unsustainable scenarios such as collapse. Therefore our future decision makers need to be capable of interacting with the future, be able to create scenarios where humanity is tested in manifold ways, acknowledge and analyse where unsustainable trends will lead us and envision a future with hope and share this vision with others. Rieckmann highlights anticipatory thinking as one key competence needed for “understanding global problems of unsustainability and contributing to the shaping of the world society in terms of sustainable development” [6].

By using a competence approach to develop a higher education course entitled “*Sustainability and the Future*”, we have begun an action research cycle to inform our own practice on how best to engage students on sustainability issues and explore their own perceptions of the future. In particular, through futures studies methodologies and reflective journaling, this research aims at theoretically modelling students’ anticipatory competence and gaining insight into how this can be fostered in higher education.

2. Theoretical Framework

2.1. The Setting for a Competence Approach to Education

Key competencies and competence-based education have arisen as an approach that advocates the use of measured changes in student behaviour or “outcomes” as their focus for teaching. This movement challenges educators to measure their impact not by the input (learning objectives, class size, pupil teacher ratio, etc.) but by the desired output (successful application of abilities to a demand) and to orient education around this [9]. Since the 1970s there has been a growing pressure from employers that education institutions prepare their students with instrumental training as the new members of the workforce. This “outcome-oriented” education focused on developing graduates that could perform competently in their fields and adapt to changing conditions and workplaces. While detractors of this view eschewed what they saw as an “instrumentalisation of education”, supporters sought to develop this new idea of competence as a perspective toward education; instead of covering a “laundry-list of learning objectives” educators were asked to teach for what “worked” and could measurably and reliably be shown to work.

In many Anglophone countries there is still opposition to the use of competence as some believe it still gives a positivist and highly instrumentalised view of education—as merely being there to produce workers for the economy and only valuing what can be measured. Indeed the opening speaker Ruth

Dreifuss at the Definition of and Selection of Key Competencies (DeSeCo) Symposium [10] encapsulated this in her speech where first she spoke of “education system’s central mission of equipping individuals with the qualifications they need for economic integration” before later acknowledging that education could be for social, cultural and political development and calling competences the “indispensable tools” to promote e.g. human rights. However, now the OECD has a far broader view of competence, and in later reviews it explicitly mentions that sustainable development and social cohesion critically depend on the competences of our population [11].

In the context of the Bologna process, the competence-based education approach has gained importance as well in higher education and a need for a competence orientation has been formulated [12]. Competence-based education can be characterised as learner-centred and oriented to the professional practice [13,14]. Thus, an advantage of a competence-based curriculum in higher education is that students can develop domain-specific as well as generic competences which enable them to cope with crucial challenges in the private and the professional sphere. Competence-based education is expected to improve employability and citizenship skills of the students [6]. Not only in Europe, but also in other regions of the world competence-based education has become a key element of reforms in higher education [14–16].

2.2. The Competence Approach

In this paper competence is understood as an “interplay of knowledge, capacities, skills, motives and affective dispositions” [6] and added to this is the prerequisite to have the competence-based education reflected in successful action [17]. The major point of competence is that it involves assessing what works well for a given task or performance and works backward to describe the criteria inherent in this successful action [18].

Competence in educational research has taken a long time to be clearly defined and some would argue that this terminological battle is still ongoing [19]. Many have decried competence as a fuzzy concept [20]. Winterton explores the international difference in definitions and use of competence showing that the US and Western European definitions of competence vary strongly from each other and how the challenge is to develop a “consistent and coherent typology of competence” [21]. In the discipline of education the term has a variety of meanings—from specific skills to the entire set of cognitive, motivational and social prerequisites required for successful action [22]—although these can be seen as a spectrum from a narrow to a broad or holistic view of competence [23]. Sadler pointedly delineates the terms competence and competency, highlighting the holistic nature of the former and using the latter term only as a synonym for skill [24]. In this paper we follow this division of competence and competency.

Within competence there exist many sub-classifications of differing types of competence—such as Winterton’s cognitive (knowing that), functional (knowing how/skills) and social competence (working with groups/motivations) [21]. However, two major publications work as a foundation for the current discourse on competence, Weinert’s “Concepts of Competence” [22] and the OECD’s Definition and Selection of Key Competencies [25]. In the first document, Weinert explores the theoretical reference systems that use competence. He gives an overview of nine major conceptions of

competence, three of which will be described below: general cognitive competence, specialised cognitive competence and key competencies.

General cognitive competence can be seen as content and context free abilities and aptitudes that are transferable to any situation. Critical thinking could be seen as a general cognitive competence in this framing [22].

Specialised cognitive competence can be seen as “mental network of content specific knowledge, skills and routines” and can be seen as linked to a specialist area such as chess playing, or driving a car. A broad range of knowledge, experience, skills and aptitudes that are intrinsically linked to a specialised area give these competences [22].

Key competencies can be seen as a development of the general competence model where the competences listed are typically context free and transferable, but these competences are given status as priority competences for educational targets. These include literacy, numeracy, and ICT skills. In 2003 the OECD launched its report on the Definition and Selection of Key Competencies (DeSeCo) where they outline key competencies as those that help contribute to a well-functioning society and a successful life and that further:

- “Contribute to valued outcomes for societies and individuals;
- Help individuals meet important demands in a wide variety of contexts;
- Be important not just for specialists but for all individuals” [25].

Rychen and Salganik define a framework for the selection of key competencies in three main areas [25]:

- Using tools interactively
 - Literacy, numeracy
 - Critical thinking
 - Using technology
- Functioning in heterogenous groups
 - Empathy
 - Ability to work in teams
 - Conflict management and resolution
- Acting autonomously
 - Defining interests and asserting rights
 - Seeing the bigger picture and how you fit
 - Developing and completing projects

While this can be seen as vague, they add that competences that could be mapped onto this framework would by necessity be open to change to meet the demands of society. As Barth *et al.* state: “They [key competencies] do not replace domain-specific competencies [...] [but] rather bear a different, a wider focus, pooling different competency classes and being situated transversely to them” [17] (p. 417).

2.3. Key Competencies in Higher Education for Sustainable Development and toward a Definition of Anticipatory Competence

Competences are important for engaging with sustainable development, as practitioners and researchers in this field have long understood the gap between knowledge and action. Many ambitious environmental education programmes of the 1970s worked on the basis of “if people are given enough knowledge about an issue, they will act to prevent it” and subsequently failed [26]. In approaching education for sustainable development from a competence point of view, researchers have explored the key areas that are required to succeed in the area of sustainability [6,7,26–30]. In defining “key competencies for a successful life and well-functioning society” the DeSeCo Report [25], categorises one area of key competency as acting autonomously and seeing the bigger picture. This could definitely translate to sustainability competence. Alternatively a definition of sustainability competence could be derived from a related occupational field [31]. Thus the next question would be which occupations require people to be competent in sustainability. Wiek *et al.* focus on the competences needed for future decision makers, planners and transition managers in researching competences for sustainability research and problem solving [7]. Other researchers see sustainability competence as necessary for all students for their autonomous participation in sustainable development [6]. Three key models of sustainability competence are summarised below: Wiek *et al.*’s *key competencies in sustainability* [7], de Haan’s *Gestaltungskompetenz* [27,32] and Frisk and Larson’s *sustainability competencies* [9].

Wiek *et al.* describe a framework of *five key competencies for sustainability researchers and problems solvers* that are extra to those needed for other learners [7]. These are namely Strategic, Interpersonal, Systems Thinking, Normative and Anticipatory Competence; and they are sketched into a framework as to how they relate to each other when exploring a complex sustainability problem (Figure 1). Starting on the left, there is a complex problem (needing systems thinking competence), going right the learners can anticipate the impacts of this problem and consider alternative futures with or without intervention (anticipatory competence). Learners are able to choose a more desirable sustainable future (normative competence). They then develop a strategy to work toward that desirable future (strategic competence) and each step of the way they have to work with people, for example the local government (interpersonal competence).

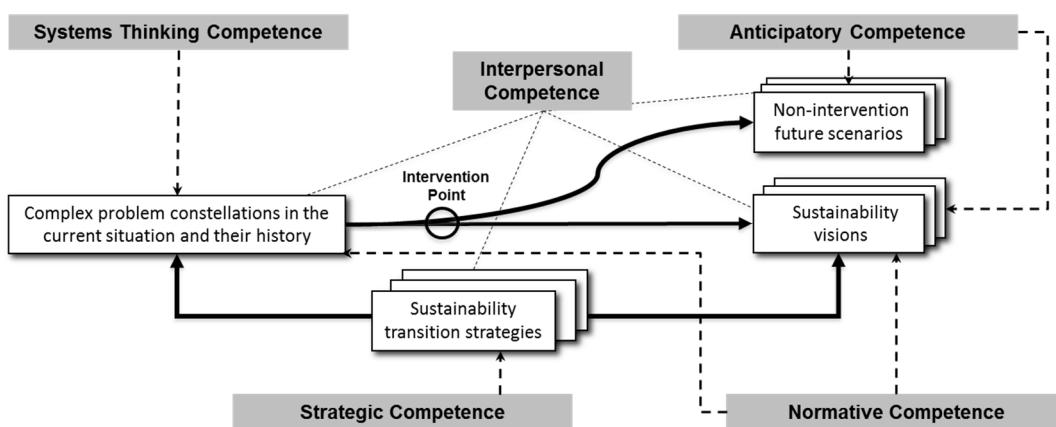


Figure 1. Sustainability Key Competencies [7].

Wiek *et al.* specifically describe *anticipatory competence* as “the ability to collectively analyze, evaluate, and craft rich ‘pictures’ of the future” [7]. This is related to understanding the concepts of time; uncertainty and epistemic status; inertia, path dependency, and noninterventions; consistency and plausibility of future developments; risk, intergenerational equity, and precaution; as well as to being able to use methodologies such as scenario planning, forecasting, backcasting, and participatory anticipatory approaches (e.g., Delphi, Future Workshop) [7].

Anticipatory competence is also seen as part of de Haan’s “*Gestaltungskompetenz*” or “shaping competence” which originally meant “the capacity to identify and localize phenomena in the context of their global relations and effects” [32] but has since been developed to be an ability of those that “through active participation, to modify and shape the future of society, and to guide its social, economic, technological and ecological changes along the lines of sustainable development” [27]. De Haan further delineates *Gestaltungskompetenz* into twelve sub-competences including the ability to “*think and act in a forward-looking manner*” [27].

This means students are:

- (1) aware of research methods used in future studies (for example, scenario technique, planning games, future workshops), in order to analyse the problems of non-sustainable development and anticipate possible opportunities for sustainable development (in relation to their own lives);
- (2) assess and apply the findings of future research in the drafting of sustainable development processes with regard to ecological systems, social justice, economic developments and political action;
- (3) are able to recognise their own potential future needs and possible means of provision, and can describe the need for providing for greater social security in the future based on their own situation;
- (4) are able to identify, analyse and assess examples focussing on the present, starting from their own lives. [27]

In another sub-competence (the ability to “refer to the idea of equity in decision-making and action planning”), de Haan also writes that students with *Gestaltungskompetenz* should be able to “identify conflicts with regard to inter-generational justice and provide examples of how to overcome these conflicts” [27] (p. 324).

Frisk and Larson discuss “*foresighted thinking*” which for them “involves asking questions about long-term trends and possible future scenarios, while also employing anticipatory approaches to understand, mitigate, or adaptively prepare for future changes in system dynamics” [9] (p. 8). They go on to add that this thinking also involves placing value on the future and understanding intergenerational equity.

Thus, although there is some research on key competencies which is relevant for sustainability in general and to a small extent also on anticipatory competence in particular, research on teaching such competencies is still very limited. “Do students really develop the competencies we want them to develop? Are teaching and learning approaches really effective? There is still much research to be done to operationalize competencies and develop instruments for assessing and monitoring competence development” [33] (p. 5). What Adomßent *et al.* [33] state generally for sustainability key competencies, is especially true for anticipatory competence. For this particular competence, there is

still a great need for operationalising it more in detail and analysing how it can be effectively developed in higher education. In response to this need, this paper deals with the development of anticipatory competence in higher education.

2.4. Foresight and Futures Studies

Futures studies and foresight can be said to be the exploration of change at different future times and at different scales [34]. Through exploring various future states (including possible, probable and preferable futures) through a spectrum of methodologies, futurists explore trends and fads, develop alternative futures as scenarios and critically analyse the underlying assumptions present in images of the future. Typically, many of these activities are participatory and thus develop interpersonal ownership of the task among the performing group, many scenarios can be used to make normative decisions about the futures we want, and there is an overall emphasis on the plurality of futures—being able to hold multiple futures in one's frame of reference, preparing oneself for discontinuity and surprise.

The discourse on developing competence in anticipation in foresight and futures studies is rich and holds that there are three main components to foresight and futures studies—futures context and worldview, future knowledge and skills, and future methodologies [35]. Ramos notes “the perspectives people hold, their worldview, their ideology, mediates the communication of foresight—the way people ‘hear’ news and people’s interpretations of events are critical to the communication process” [36] (p. 1121).

In the area of future knowledge and skills, Hicks outlines *nine key concepts in futures studies*, namely alternative futures, hopes and fears, sustainable futures, visions for the future, the interconnectedness of past, present and future, the ability to manage change, the state of the world, differing views of the future and valuing future generations [37].

The methodologies used to explore the future can be seen as the main praxis of futures studies and Inayatullah separates *six major pillars of the application of futures studies* into practical exercises (mapping, anticipating, timing, deepening, creating alternatives, and transforming) [38]. Each of these pillars cover specific methodologies, e.g., deepening includes causal layered analysis—a methodology developed by Inayatullah to dig beneath the surface to uncover deeply held worldviews in people's future pictures. A popular technique that explores desired futures is backcasting, which involves “the development of normative scenarios aimed at exploring the feasibility and implications of achieving certain desired end-points, in contrast to forecasting studies aimed at providing the most likely projection of future conditions” [39] (p. 841). In backcasting, the group starts by agreeing on a desired end-point, e.g., a community developing a vision of their town being energy independent by the year 2050. They then work backwards to see how this vision can be achieved and through the backcasting methodology the group can more clearly see what opportunities and challenges need to be tackled in the present in order to work toward this normative scenario. Other methodologies used by futurists involve constructing, mapping, deepening, analysing, transforming and helping others create alternate images of the future, to “help people become competent, effective and responsible actors, both in their personal lives and in their organisational and societal roles” [35] (p. 39).

3. Research Question and Objective

Against the backdrop of the described theoretical framework, this paper asks: What is anticipatory competence and how can it be fostered in higher education?

Given this focus of research, three sub-questions are relevant:

- What individual dispositions do students perceive to be important when dealing with future issues?
- Through which topics and pedagogies can anticipatory competence better be fostered in higher education?
- What role does reflective learning play in developing students' critical paradigm of the future?

This paper aims at contributing to the further development of the competence debate in higher education for sustainable development and particularly to the modelling of anticipatory competence and the better understanding of students' development of anticipatory competence.

4. Methodology: Action Research Approach

In pursuing these research questions, the researchers opted for an action research approach. Action Research, first elaborated in the 1940s [40], is a form of research where the researcher takes an active participatory role in a form of social-based research. Action research develops practical applicable research that can improve the practice of the research and work with the research group to help them answer questions pertinent to them. Action research can provide depth to a study and can help researchers develop a "rich understanding of the texture of difficult issues" [41] but concurrently suffers from a lack of generalisability as it can be seen to be based in the "swampy lowlands" of practice based research as opposed to more theoretical positivist approaches [42].

4.1. The Sustainability and the Future Course

Through reviewing a span of literature on futures studies and education for sustainable development *inter alia* [43–46], a course targeting the six pillars of futures thinking and the nine key concepts of future studies through the lens of sustainability was developed. The course "Sustainability and the Future" was rolled out at the University of Vechta, Germany, in February 2014 for the summer semester. Developing "non-linear teaching strategies that embody the experience of the future for students" [43] and a curriculum "inspired and informed by idea of the triple bottom line" [47] and valuing future generations [48], the course explored aspects of futures studies (e.g., backcasting, timeline development, scenario planning) while also covering the fundamentals of the sustainability discourse (systems thinking, planetary boundaries, international agreements, and sustainability design approaches such as permaculture and transition towns).

The "Sustainability and the Future" course originated from the corresponding author's previous work in Ireland on the development and delivery of a community sustainability training programme "The Powerdown Show" and combined future-studies concepts and methodologies to its framework [44]. Through updating the materials and applying a competence-based approach the first "Sustainability and the Future" course was developed and tested through a series of pilot workshops in November

2013 before officially starting the following February 2014 with the corresponding author as the lecturer. Based on the design principle of backward design/forward implementation, the initial objective was to create a clear picture of “post-degree outcomes” [18]. Adapting Wiek *et al.*’s definition of anticipatory competence [7], the students were informed in the beginning of their *intended learning outcomes*:

- To be able to think seriously and critically about the future
- To develop skills to craft, analyse and evaluate futures
- To explore sustainability as a key driver of future events

During the semester-long course the students are introduced to a number of sustainability themes and approaches including climate change, peak resources, systems thinking and ecological design (Table 1). They also explore futures studies as a concept and use futures methodologies each week to further explore sustainability as a key driver of future events. These include such methodologies as trend analysis and environmental scanning, backcasting, scenario modelling and developing future timelines. They develop a project examining the future of their university town using key futures studies skills to provide a framework for alternate scenarios, which are judged on their consistency and plausibility. In the second half of the semester they are given four different voluntary visioning exercises which make up part of formative assessments that will improve their performance in the final exercise.

Table 1. Schedule of the Sustainability and the Future course.

Timeline	Class titles
Week 1	Introduction to sustainable development and futures studies.
Week 2	Drivers of a sustainable future—Climate Change—Trend Analysis—IPCC Scenario
Week 3	Drivers of a sustainable future—Peak Oil and Scenario modelling
Week 4	Drivers of a sustainable future—System limits—Backcasting
Week 5	Drivers of a sustainable future—Population and Values
Week 6	The Future of Energy—Newspaper from the future
Week 7	The Future of Values and Mobility—Values Meditation—Joanna Macy’s Widening Circle
Week 8	The Future of Food—Permaculture—V for Victory—Letter to future self
Week 9	Ideologies of the future—Transition Towns—Energy Descent Planning/Timeline
Week 10	Responding to the future: Field trip to a sustainable community
Week 11	Responding to the future: College as a sustainable community
Week 12	Responding to the future: Sustainability in long term policy
Week 13	Student led seminar exploring the future of Vechta.

To further show how the course integrated aspects of futures studies and sustainability, what follows is the layout of the second class which covers climates change. Each class lasts 3 h (4 h with breaks).

First fifteen minutes: Ice breaker—Climate Change Web—Each student is given a card describing an activity from somewhere along the chain of activities that leads to increasing GHGs and reduced carbon sinks. E.g. the spread of beef farming. They then have to find students who are affected by the activity or the students they themselves affect. We come back to discuss what are the major effects of this complex system, and where are the points for intervention. This activity also highlights the systemic nature of climate change and will be referred back to in the Systems class two weeks later.

The next 30 min are taken up with exploring the first scenario that was given to the students as a bridging exercise to read between the last class and this. The scenario is entitled “The Gulf Stream shuts down” and postulates what would happen if climate change’s melting ice in the polar caps switched off the ocean current that keeps the western seaboard warmer than Russia. It serves as an exercise for students to explore a threat of climate change that has far higher consequences than those they normally think about with relation to Western Europe (flooding, increased range of mosquitos, etc.). The Gulf Stream shutting down is a dystopian scenario and is discussed as such in contrast to a trend extrapolation. This leads into the discussion and ten-minute presentation of trend analysis and cyclical trends and developing knowledge of a probable future, with talks of previous trend analysis documents such as “The Limits to Growth”.

The next 45 min use a participative presentation where students are split into groups researching “the greenhouse effect”, “the causes of climate change” and “the effects of climate change” for 15 min. The groups then give a ten-minute presentation to the rest of the class on the topic. This exercise serves to give the lecturer an idea of the level of knowledge of climate change in the room and also their level of presentation skills.

After a break, the lecturer goes over the science of climate change and discusses any areas that were not covered sufficiently (e.g., often Carbon Sinks are only briefly touched on by the students). The lecturer then presents a fifteen minute slideshow on Climate Change and the media, which ends with time-lapse footage of shrinking glaciers. Here the students are asked to discuss the debate of climate change, false equivalence and the concept of risk.

In a risk exercise, students are given short scenarios e.g., “you forgot to feed your mouse for a week, *and the mouse dies*” or “people globally act too late on climate change and *saltwater penetrates the drinking-water supplies of a large number of Bangladeshis causing millions to become environmental refugees*” and they are then asked to arrange themselves in a line down the room where it is explained that the sentences they have are statements of risk which are always made up of the seriousness of the consequences (*in italics*) and the likelihood of its happening. They then arrange themselves according to the likelihood of the event, and then separate and reform themselves in a line only according to the consequences (from most disastrous to least). Lastly, they are asked to see their statement as a whole statement of risk and line up according to most and least risky.

The lecturer repeats information on learning journals from the first week and how they should be written no more than two weeks after the lesson. Then the last segment presents the UN Framework Convention on Climate Change and the trend analyses of the IPCC 5th reports are divided out amongst groups for bridging work that they review and report back on in the next class.

The course is offered in the “Profilierungsbereich” (profiling area) of the Bachelor programmes at the University of Vechta. The “Profilierungsbereich” includes various courses which are offered for different undergraduate study programmes (General Studies) and which facilitate the development of professional, methodological, social and action competences. All undergraduate students at the University of Vechta hence have to take some courses from the “Profilierungsbereich”.

The “Sustainability and the Future” course has run successfully for two semesters with 13 (April 2014–July 2014) and 16 students (September 2014–February 2015) respectively ranging in age from 20 to 45. Figure 2 shows the degree specialities of these students. As the course is an optional

course for students from different undergraduate study programmes the class is quite diverse, there nevertheless remained a strong trend for students to study sociology and/or business and ethics.

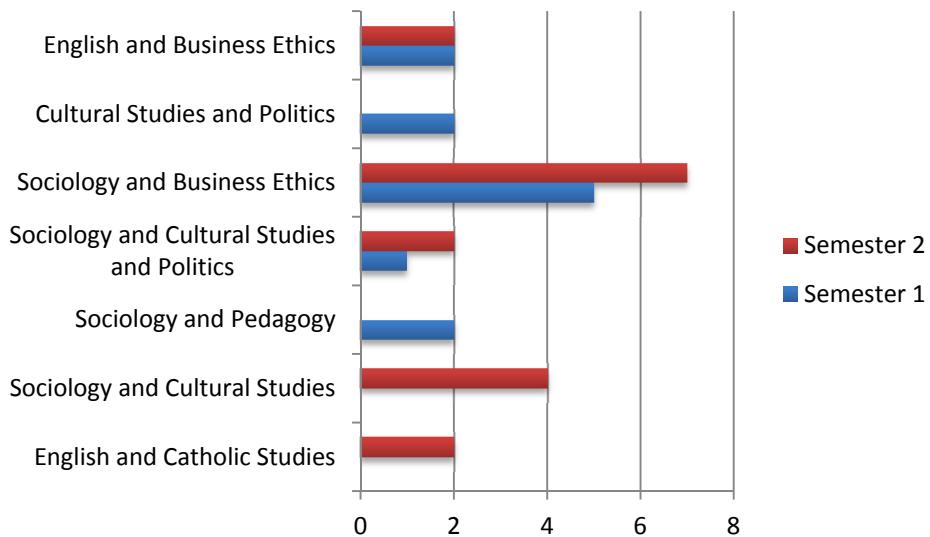


Figure 2. The degree specialities of students in the “Sustainability and the Future” course.

One difference from the first semester to the second was that the cycling field trip to the community “Prinz Höfte” was unable to be repeated in the winter months and so that class featured a section on complementary currencies instead.

The course was assessed partly on a group work presentation at the end of the year and on the submission of learning journals—the journals’ contents were not judged but this measure meant that journal entry stayed high. The presentation was a presentation on the future of Vechta to the public using scenario and time-line methods.

4.2. Reflective Journaling

Reflection here is defined as “a process by which experience is brought into consideration and [...] deriving from [this], the creation of meaning and conceptualisation from experience and the capacity to look at things as potentially other than they appear, the latter part embodying the idea of critical reflection” [49] (p. 99). Reflective journaling has been a main source of data collection in this action research project and each semester students were handed a series of prompting questions with which to reflect on the classes and document their learning process. Drawing on theory from Schön’s reflective practitioner [42], where propositional knowledge is made effective through reflection on action, this study categorised each journal entry according to one of four levels of reflection (Table 2). Then through thematic analysis, the constituent elements of anticipatory competence were cross-referenced with these to explore topics with the greatest opportunity.

Table 2. Reflective writing in journals [50].

Levels of Reflection	Description
Descriptive writing	Just describes the event or paraphrases a reading.
Descriptive reflection	Description but with some justification and the consideration of possible alternative viewpoints.
Dialogic reflection	An ability to step back from events—analyse the process and integrate.
Critical reflection	A deeper awareness that actions and events are located in and influenced by multiple historical and socio-political contexts.

4.3. Qualitative Data Analysis

This research follows the qualitative data analysis method of Mayring [51], of working through the coding and then reducing the number of codes by roughly 50% in order to see the frequency of signals in text analysis. The learning journals were read through and coded and reread again and many codes were reduced or merged to increase reliability.

Focus group conversations were carried out with 13 students from the second semester (Table 3). This was in order to triangulate some of the live coded aspects of anticipatory competence. A topic guide was planned in advance and all groups were recorded and transcribed.

Table 3. Overview of data collection.

Semester 1	April 2014–July 2014
Female students	5
Male students	8
Journal entries	75
Semester 2	September 2014–February 2015
Female students	11
Male students	5
Journal entries	121
Focus groups	3 (1 × 5, 1 × 3, 1 × 5)

5. Key Findings

5.1. Importance of Knowledge and Methodologies

Hayward *et al.* when writing about the *knowledge base of futures studies* describe it as “a set of concepts or themes or issues or knowledge that defines the heart of a field of inquiry, and that this remains so, even as those concepts, themes, issues or knowledge may alter and change over time” [52] (p. 184). In response to all focus groups, when asked whether anticipatory competence was more knowledge of the state of the world or the skills to apply to any knowledge, most of the group responded that it was important to have a firm grasp on current affairs, but the group also valued the methodologies such as environmental scanning [53]. In response to a scenario project that they worked on in their third week, student LK wrote this about her use of environmental scanning:

“For example when I hear something about a science fiction movie, I ask myself how people come up with those ideas. It still feels like a very difficult task to create good pictures of the future, specially concrete and specific ones, instead of general statements. But, I believe that the way I am looking at the future has already changed and is still slowly changing. When I think about how the world could evolve I can use methods like picking out drivers (which help to find a starting point) or thinking of systems to understand how these drivers may influence each other and how one effect may result in another effect.” (LK, female student, “systems” class, winter semester 2014)

5.2. Levels of Critical Reflection

Concerning the levels of reflective writing, 16% and 21% of students were rated as *critically reflective* in their journal entries. This meant that the entry showed that the student was examining assumptions made in the material covered or assumptions that they had been making themselves. The student showed that they thought about their actions, explored alternatives and considered what the experience taught them about themselves. This level of critical reflection is seen as evidence of *reflection on action*—internalising the activities and behaviours explored in the lesson. These students move beyond learning about futures methodologies to approaching anticipatory competence. Quotes from such students show the ability to step out of their own perspective and critically explore the issues explored in the classes:

“We then talked about predictions of the future and how we cannot really predict it, that we only can try to speculate about what could happen. And that is what I find quite interesting: Many people I spoke to, told me that for example the Club of Rome was not right and so the whole thing about climate change and greenhouse effect is a lie. It really astonished me how people think that soothsaying is possible and if you do not predict the future 100 percent correct, you are a liar.” (SOK, male student, “population” class, second semester)

“There are a lot of aspects I didn’t think of and fields that are affected by sustainable future developments. These ideas were put forward by scenarios—they made me think of the plan-ability of future and underlined certain things in my mind: that the future is also influenceable.” (SE, female student, “sustainability” class, first semester).

As can be seen in Table 4, the proportions of students writing descriptively reflective, dialogic and critically reflective learning journals increased in percentage from the first semester to the next.

Table 4. Levels of critical reflection in students per semester (in percentages).

	Semester 1	Semester 2
Descriptive	16	4
Descriptive Reflection	43	37
Dialogic	25	38
Critical	16	21

Table 5 also shows the figures in percentages—this time reading left to right. The large percentage of critically reflective entries in the “Prinz Höfte” class belies the small sample size of the entries for that class which were only seven from the first semester. Likewise the money and education workshop was only available to the second semester students. If these two are set aside, the strong results are in classes such as values, transport and population.

Table 5. Percentages of learning journal entries from descriptive to critical.

	Descriptive	Descriptive Reflection	Dialogic	Critical	Sum
Sustainability	39.5	15.8	21.1	23.7	100.0
Climate Change	38.9	16.7	16.7	27.8	100.0
Peak Oil	48.5	18.2	9.1	24.2	100.0
Systems	50.0	15.4	7.7	26.9	100.0
Population	52.4	9.5	9.5	28.6	100.0
Values	44.4	11.1	14.8	29.6	100.0
Transport	41.7	12.5	16.7	29.2	100.0
Food	45.0	15.0	15.0	25.0	100.0
Community/Prinz Höfte	0.0	14.3	42.9	42.9	100.0
Money and Education	61.1	22.2	0.0	16.7	100.0
Education	53.9	15.4	7.7	23.1	100.0
Politics	33.3	33.3	11.1	22.2	100.0
Number of Diary Entries	129	46	40	74	

The values class was especially noteworthy as each semester this is the time that the class was taken outside to do some “despair work” in order to face squarely the bad news that the trend analysis and scenarios of the previous classes of climate change and peak resource use were showing them. The despair work is based on activities run by Joanna Macy [54] in her “work that reconnects” and gets students seeing environmental issues from a variety of perspectives, including the polluter’s perspective and the non-human perspective. This is to counter what Macy refers to as repression of our fear that can lead to cognitive dissonance, cynicism and apathy among other things. This assertion is backed up by many academic sources [55].

“It offered a new approach to deal with the topic of sustainability which was very interesting. In addition, some of the psychological resources of repression mirrored my feelings which is reassuring and makes it easier to handle these feelings. It was also quite shocking to see what psychological consequences it could have to deal with the topic of sustainability. However, it was good that we looked at the consequences of repression in order to face these consequences. Psychological health is very important. That is why it is so important to look at this topic. Furthermore, it is also important to look at the external sources of repression and to recognize them. I have not had so much contact with the psychological side of sustainability which is quite sad and I do not think that the psychological aspects of sustainability should be neglected because it is very important to stay physically as well as mentally healthy in order to contribute to sustainability.”
 (AS, female student, “Values” class, second semester).

Cognitive dispositions include current knowledge of the state of the world, procedural knowledge on how to perform backcasting and forecasting, and the other methodologies. Overall the percentage of dialogic or critical reflection associated with the classes ranged between 40% and 50% of entries. Occasionally students felt unsure as to the use of some of the more obscure methodologies such as the timelines or scenarios.

“In the last class we continued working on our scenarios and started to present them thereafter. I do understand this now better but I’m still asking myself in which way that would be useful for scientific reality.” (LS, male student, “Peak oil” class, second semester).

5.3. Elements of Anticipatory Competence

When the first action cycle was over and the learning journals were compiled, common coding elements emerged through using Mayring’s inductive category formulation methods [51]. These elements of anticipatory competence were highlighted and then weighted by focus groups from the second semester with a maximum number of 26 being possible. The weighting of these elements was determined by the 13 focus group participants on a scale of relevance to the development of anticipatory competence. Participants graded the elements with 0 being irrelevant, 1 being somewhat relevant and 2 being highly relevant. Three separate elements were completely agreed upon as being important elements of anticipatory competence. These are hope, valuing nature and backcasting. Additionally, valuing global justice is seen as one of the most important elements. Of the five “futures studies” methods listed, scenarios performed the lowest with a weighting of 19 (Figure 3).

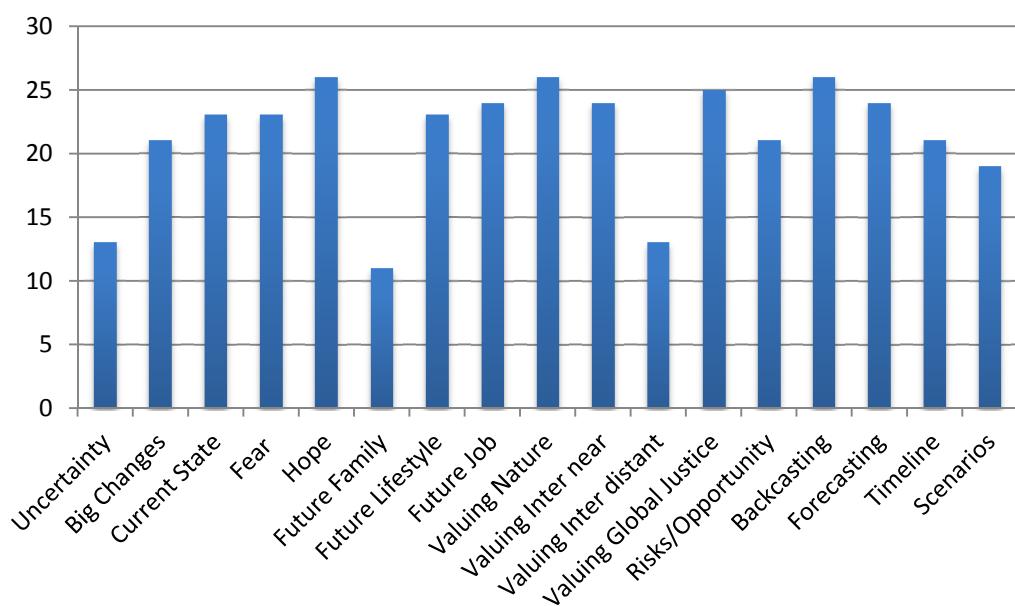


Figure 3. Weightings of 13 students to the categories of anticipatory competence by assigning 0, 1 or 2 points each to every element (mean value: 19.9).

Interestingly when asked about personalised concepts of the future, not many felt that conceiving your own future family was a strong constituent in what makes up an anticipatorily competent worldview.

Students were also asked how anticipatorily competent people should value ideals, such as nature and global justice. When asked about future generations, one of the focus group participants asked that this category be separated as they felt that while they cared about what happened their grandchildren (Value Inter Near), they had no fidelity to further generations (Value Inter Distant). This divide was then echoed by the rest of the focus groups.

6. Discussion of the Findings

Concerning *individual dispositions* which are important when dealing with future issues, the students' perspective confirms the relevance of concepts such as uncertainty and methodologies such as backcasting which are discussed in the sustainability competence literature to be related to anticipatory competence [7]. In accordance with Hicks [37], who states that we must inform behaviour from hope and fear as healthy aspects of futures thinking, the findings show the high importance of hopes and fears; concepts which are not included in the definitions of anticipatory competence of de Haan [27,32] and Wiek *et al.* [7]. Additionally, the students' high weightings to valuing nature and global justice indicate blind spots in these definitions. However, these aspects of anticipatory competence—hope and fear as well as valuing nature and global justice—are very hard to measure or even worse, assess. One activity that proved helpful in getting students to reflect on their fears and hopes, was writing to their future self:

"By writing down feelings, wishes, dreams, plans for the future and by describing the status quo, we might develop a different understanding of changes around us and of the impact that our choices eventually have. I kind of want to skip one year in order to read my letter now." (YA, male student, "Future of Food" class, first semester)

However, a few students who exhibited more descriptive reflection styles also were shown to exhibit hope but in these situations it was hope in the story of progress. Through the course we engage with dystopias such as David Holmgren's Life Boats scenario [56] but also follow ESD research [57] that doomsday visions need to be used sparingly. If there is too much negativity without the knowledge of sustainability initiatives that are working to steer society away from such dystopias, this can be disempowering. However, it could be argued that this is a fine line to tread and a small proportion of students would still occasionally write about their hope for a "business as usual" or a green tech future [56], without challenging the plausibility of their worldviews or criticising other worldviews but ignoring their own assumptions as can be seen in the example below of one student's dislike of permaculture.

"The idea of permaculture sounds interesting. Having a garden, which "lives on its own", is good for environment and provides food. But I don't know if this is the future. With more and more people living on our planet, having less and less space to live, permaculture is not for everyone and everywhere. In my opinion it is good for places without good infrastructure, e.g., "somewhere in the middle of nowhere". In urban or suburban areas rooftop gardening is a better alternative. And to be honest, I for myself prefer a classical

garden with a nice lawn instead of a small field of vegetables.” (JBR, male student, future of food, first semester)

With respect to *topics and pedagogies* which can foster anticipatory competence in higher education, the case of the “Sustainability and the Future” course shows that some sustainability-related topics (values, transport and population models, for instance) are more adequate to create settings for critical reflection on the future, and that methodologies such as scenario planning, forecasting, backcasting help the students to better understand the future. This confirms the importance of being “aware of research methods used in future studies” [21]. However, it has been highlighted both through the learning journals and the focus groups, that a certain body of knowledge is needed to serve as a framework guide to use these anticipatory methods; and it can be seen that students still are unsure about the usefulness of methodologies such as scenario planning in the real world. Much more experience and practice than the “Sustainability and the Future” course could offer is necessary for developing a more advanced competence in using future studies methods.

Last but not least, the findings indicate the *relevance of reflective learning* for developing students’ critical paradigm of the future. In particular elaborating the learning journals helped the students to critically reflect on future issues.

Owing to the inability to cycle to Prinz Höfte in the winter semester, extra time was spent exploring the topic of complementary currencies. However, if the journal entries are compared between the semesters, there was more critical reflection obvious in the journals detailing the excursion – which recommends bringing the class outside again for the third semester.

Can it be said that the increased amount of critical reflection in the second semester is owed to the improved techniques? The guidelines for journaling were updated between semesters so it is possible that the update was simply due to clearer instructions. It could also be because of the corresponding author, as the course lecturer, being more confident with the context and the material and delivering the futures methodologies. However, apart from the change to one class as mentioned in the above paragraph, most of the reading material, activities and presentations stayed the same. Levels of critical reflection will continue to be observed in future action research cycles to further understand this trend.

Robinson *et al.* state that for proper participatory visioning process to occur it needs complete buy in across the community [57]. In the university community there likewise needs to be whole university commitment to sustainability to provide a “pedagogy of place” [58] that fosters sustainability competencies. In the assessment of the students of the “Sustainability and the Future” course they currently draw up scenarios that are only used once for a class or two and then forgotten. However, the University of Vechta is currently developing its sustainability agenda and there is a perfect opportunity for the students of the current semester to inform this planning process, thereby creating conditions for action and reflection on that action.

As much as the lecturer specifically tries to foster anticipatory competence in the course, it cannot be isolated from other sustainability competences such as described by Wiek [7] (see Figure 1). To this end, the lecturer covers systems and values (systemic and normative competence) in respective classes of the course. The majority of the assessment is based on an end-of-semester presentation that uses scenarios and backcasting to motivate the audience toward working for a better future for the University and city of Vechta (interpersonal competence). Having feedback from the students in the

early action inquiry cycles, the lecturer has gone on to explore more strategic techniques with the students (strategic competence). This includes activities like the Transition Town Energy Descent Action Plan (EDAP) where communities form a timeline toward a preferable future, agreeing targets and strategies to achieve them each year along the way. The current semester of students' presentations are being brought to inform the University sustainability committee with their recommendations on future strategies to develop as a sustainable campus [59].

7. Conclusions

We have shown in this paper that using key methodologies of futures studies and dealing with key sustainability topics the “Sustainability and the Future” course facilitates the *development of students’ anticipatory competence*. The course helps the majority of the involved students to better understand the future and to critically reflect both on their own actions and future issues of the (world) society. Certain subject areas such as values, transport and population models provoke more critical reflection on the future than others. From the perspective of the students, particularly hope and valuing nature and global justice are crucial for anticipatory competence.

The role of reflective practice in fostering sustainability competence is still developing and *further action research inquiry cycles* are needed to explore the rate of critical reflection and connect it with specific activities within the classes and outside variables. Much research remains to be done in order to more fully understand what anticipatory competence is and how it can be fostered in higher education.

By presenting data concerning students' development of anticipatory competence in the “Sustainability and the Future” course, this paper contributes to the further development of the competence debate in higher education for sustainable development and particularly to the modelling of anticipatory competence and the better understanding of students' development of anticipatory competence. We hope to inspire fellow researchers and practitioners to generate useful insights on how to operationalise and develop anticipatory competence in higher education.

Acknowledgments

The authors would like to acknowledge the contribution of the students of the Sustainability and the Future classes to date, and the contribution of the staff and administration team in University of Vechta in accommodating and promoting the course. The corresponding author is supported by a Ph.D. scholarship from the University of Vechta. Finally, the authors thank the three anonymous reviewers for their constructive comments on an earlier draft of the article.

Author Contributions

Principal design, research, data analysis and writing were performed by the first author. Initial design and additional writing was provided by the second author. Both authors read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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