Innovative Coastal Education against the background of ESD – Experiences from an online training project about anthropogenic impacts on the Wadden Sea

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Abstract

Environmental education has been expanding its goals, key topics and methods in recent years, not only on the coasts but in general. The main goal is to foster structuring competence of the learners in order to prepare them for an active participation in decision-making within integrated planning processes. In order to achieve this goal, topics and methods must reflect the concept of sustainability. E-learning is an evolving approach of teaching and learning in the information society which holds great potential for application within the context of education for sustainable development (ESD). In this study, an environmental education project with young nature guides is presented, which deals with questions relevant to sustainable development of the coastal zone through an innovative e-learning application. A retrospective evaluation was carried out to identify achievements and difficulties of the project. The project met the general demands posed by local standards for ESD. However, the training concept needs to be refined with respect to central topics and educational techniques. The software tool *IKZM-D Lernen* proved to be a valuable tool suitable not only for university students, but also for learners at the high school graduate level.

1 Introduction

Environmental education nowadays is perceived as an integral part of environmental policies rather than a supplementary measure, with Agenda 21 providing the basis for modern environmental education (De Haan & Harenberg 1999, p. 4). It prepares young people for participation in environment and development decision-making and in the implementation of supporting programmes. Involving youth of today in such processes is considered to be of vital importance to the long-term success of Agenda 21, e.g. sustainable development (Agenda 21, chapter 25). With respect to the coasts and seas, education and training should aim at promoting the concept of integrated coastal and marine management (cf. Agenda 21, chapter 17). Against this background, the environmental education project *Wer, Wie, Watt?* was initiated and supported financially by BIN*GO!* – The Environmental Lottery of Schleswig Holstein. It aimed at adding innovative components to the established training of young nature guides active in the German Wadden Sea area. On the one hand, this means widening their perspectives on different human activities in and their impacts on the coastal zone. On the other hand, work was characterised by the application of new media: The project work's results – i.e. the presentation of different viewpoints: the nature conservation perspective and the user perspective – were to be presented online using a specific software tool developed within the research project *ICZM-Oder (Research for an Integrated Coastal Zone Management in the German Oder Estuary Region)*, financed by the German Federal Ministry for Education and Research (BMBF). The online system created consists of information modules for specific subjects and is serving as an information pool for the general public and fellow nature guides.

The project partners were two NGOs active on the German coast. *EUCC – The Coastal Union Germany*, a rather young NGO promoting the sustainable management of the coasts, has been

developing IT-tools for coastal education and information dissemination in the context of Integrated Coastal Zone Management (ICZM). The society for nature conservancy, *Schutzstation Wattenmeer*, is responsible for the education of young men during their community service ('Zivildienst') – an alternative to German military service - in environmental conservation at the North Sea coast. These high school graduate level learners constituted the target group for the project and will be referred as ZDLs ('Zivildienstleistende') in this text. The *Schutzstation Wattenmeer*'s environmental education centre Hallig Hooge, a certified partner of education for sustainable development in Schleswig-Holstein, provided the infrastructure for the group training. The project had a pilot character, as the topics and methods introduced to existing ZDL education were used for the first time in this context. Therefore, the project partners evaluated the achievements of and the difficulties encountered within the project. The specific goals of this study were to verify to which extent this coastal education project implemented the principles of education for sustainable development (ESD), and to examine the practicability of the software tool applied for the target group.

In this article, these aspects are treated in two separate chapters, with one of them focusing on ESD principles within the context of coastal education and the other one on the software tool. Each of the chapters provides background information, then describes the approach chosen within the project and finally evaluates and discusses the project results and experiences gained. The last chapter sums up the lessons learned. The central questions to be asked were:

➢ To what extent did this coastal education project comply with local ESD standards?

➢ To what extent did the results of the project work reflect the aims set in the project approach?

➢ Was the software tool suitable for working with high school graduate level learners?

In order to answer these questions, a qualitative comparison of the project with the framework programme for ESD issued in August 2006 by the Regional Office of the Schleswig-Holstein Wadden Sea National Park was made. Furthermore, the outcome of the project, e.g. a group of 17 information modules delivered by the ZDLs, was evaluated by the tutors, including both qualitative and semi-quantitative aspects. At the end of the project, ZDLs were asked to give their opinion on the project in an online questionnaire consisting of 15 questions. 18 ZDLs participated in the survey. Additionally, results from the tutors' evaluations were included in the analysis.

2   Applying principles of ESD in training of nature guides on the coast

2.1 Targets set for ESD: Global framework & local implementation

Since the middle of the 1990s, the overall concept of sustainable development as set out in Agenda 21 has been incorporated in the field of environmental education in Germany, provoking a drastic expansion in goals, topics and methods. Environmental education has ever since broadened its view from environmental disasters and nature protection to questions concerning the transition to a sustainable society (De Haan & Harenberg 1999a), thus turning into education for sustainable development (ESD). The goal of ESD has been clearly defined: shaping competence (German: Gestaltungskompetenz). Shaping competence means the capability of actively modifying and shaping the communities one is part of (De Haan & Harenberg 1999, p. 60). This includes the competence, proficiency and knowledge to provoke changes in economical, ecological and social behaviour (De Haan 2002). In the context of the decade of ESD (2005-2014) proclaimed by the United Nations, the German UNESCO commission called for the formation of an "Alliance for Sustainable Learning" in the 2003 Hamburg declaration. The federal government (Bund), the states (Länder), and communities as well as institutions from research, education and economy and representatives of civil society were asked to develop programmes to implement ESD on the national, regional and local level. Schleswig-Holstein, located on the German North Sea coast, is among the leading Länder in implementing ESD in Germany has among other things it has developed a certificate for ESD-institutions.

2.2 Human impacts on the coastal zone: A topic of high relevance for ESD

One aspect of growing importance in the terrestrial but also the marine part of the coastal zone is the competition for space between different land and water uses. Human activities in the coastal zone are increasing and so are their effects upon the coastal zone environment. For the German seas, the environmental status has been evaluated in 2004 (see SRU 2004), and human activities in the coastal zone have been assessed with respect to their impacts on the environment and on other uses in 2006 (Gee et al. 2006). A status report on the state of the international Wadden Sea was also presented in the recent past (CWSS 2004). From these reports, the main controversial topics can be derived. They include fisheries, contamination, shipping, new uses such as offshore wind energy production and several others. In the German Wadden Sea area one of the main uses is nature conservation: The whole coastal area with the exception of shipping routes is under national (national parks) and international protection (UNESCO biosphere reserve). To identify and resolve conflicts between various uses is an urgent necessity. The concept of integrated coastal zone management is seen as one promising way of confronting this challenge.

Bearing the concept of ESD in mind, environmental education in the coastal zone aims at enabling people to actively contribute to marine environmental protection and to a sustainable use and conservation of marine and terrestrial living resources (cf. Agenda 21, chapter 17). In this context it seems reasonable to focus on human activities and their effects on the coastal and marine environment. The above-mentioned topics are especially suitable for ESD-projects, since they allow for a detailed look at environmental, economical and social dimensions – that is why they have been chosen for Wer, Wie, Watt?.

2.3 The project concept: Organisational & educational framework

The project was implemented during the annual training seminars of ZDLs. To impart fundamental knowledge in biological and nature protection issues, didactic skills and motivation are important objectives of those seminars. In addition, a substantial contribution to developing a long term commitment to and identification with the ideas of sustainability shall be reached. Two thirds of the annual seminars comprise a mixture of practical and theoretical units including field trips, presentations, slide shows, games, laboratory assignments etc. They focus on Wadden Sea ecology and biology and include presentations and discussions about individual human uses such as offshore wind energy. The remaining third of the seminar time is usually reserved for project work during which the ZDLs are asked to work independently on a topic of their choice.

In 2006 this part of the seminar was used for the e-learning cooperation project. A total of 42 ZDLs participated in two ten-day training seminars in September and October. During the project work, the ZDLs were introduced to the topic of human impacts on the Wadden Sea by means of a role play, presentations and discussions. Furthermore, they were given an introduction to the project and the software tool was carried out. The assignment for ZDLs was to compile information about one of the proposed marine environmental topics. Materials supplied for the project work included two recent reports from governmental agencies, lists of weblinks, various monographs available in the local library, scientific articles, selected newspaper articles etc. The analysis of these sources was to be carried out with respect to three main aspects: background information, nature protection perspective and user/producer perspective. The ZDLs worked on their topics in groups of two to three people under the guidance of two tutors. At the end of both seminars each group presented interim results of their work and discussed the general outline of the topic module to be compiled. ZDLs were then asked to continue their project after the seminar and to present their work on an internet page.

Tutoring throughout the project was to be of a guiding character rather than imperative. After the seminar, tutoring was carried out as long-distance support using various means of communication.

2.4 Evaluating compliance with local ESD standards

In the ESD framework concept of the Wadden Sea National Park, one of five overall goals stated is "developing the participants' key competencies by examining user conflicts and fostering the participants' capabilities and motivation to actively contribute to processes in society" (PZN 2006).

The participants in this project were ZDLs, who are named explicitly in the list of target groups of the framework programme within the important group of multipliers. They are considered to be multipliers since they are actively involved in awareness raising during their work in the National Park, giving public presentations, guiding Wadden Sea tours and carrying out tours offered by the information centre with school classes, tourist groups and other guests of the area. The information centres of Schutzstation Wattenmeer alone have a number of 150.000 visitors each year and another 150.000 tourist contacts occur during guided Wadden Sea tours and other educational events. A large part of these tourist contacts are between ZDLs and tourists.

In order to examine conflicts – as called for in the framework programme - the uses and impacts themselves as well as the users/producers and their perspectives on the uses had to be examined at in the beginning. 14 out of 21 topics offered to the ZDLs were named explicitly as key topics for education activities. Indirectly, all topics can be considered as highly relevant to ESD in the Wadden Sea because they treat different perspectives and conflicts arising between uses and nature protection as well as conflicts between different uses.

2.5 Evaluating the information modules

Out of 42 ZDLs participating in the seminar, 35 successfully compiled information modules resulting in a collection of 17 modules. Two more topics were planned, but were not finished by ZDLs, namely eutrophication and marine contamination. Figure 1 shows all topics for which a study module was compiled by the ZDLs. The figure also shows the subdivision in three main sections to be looked at (general information, nature protection issues, user issues). In the majority of modules, general information and nature protection issues dominate. However, all except one module also inform about user issues such as economical importance.
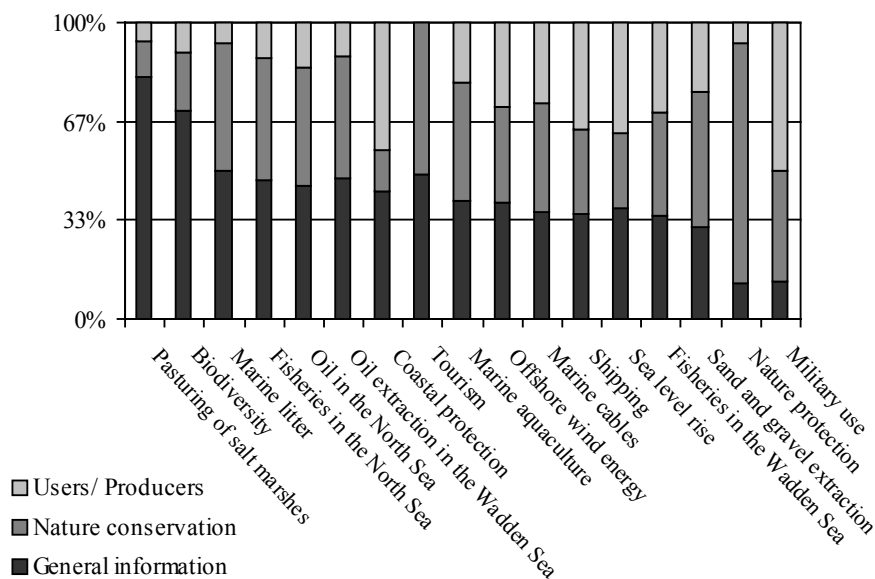

Figure 1: Topics of information modules and share of text pages (in percent) treating the three main sections to be looked at: general information, nature protection issues, user issues. All information modules can be found at http://www.ikzm-d.de/werwiewatt.

In 14 modules the ZDLs identified the user groups sharing an interest in the uses/impacts (so-called stakeholders) and described their views about the importance of the use itself. However, eight modules name only some user groups concerned, and nine describe only part of the major views expressed in public discussions. Conflicts between nature protection and the different uses/impacts are dealt with in all modules either within the chapter "Users/Producers" or as a separate chapter, while conflicts between different user groups are mentioned in four modules. Options for resolving the conflicts identified are given in nine modules with a focus on conflicts between nature protection and other uses/impacts in and on the Wadden Sea.

One of the tangible learning effects related directly to the key competencies is the large number of environmental initiatives in politics, science and society which the ZDLs got to know during the process of information investigation. Knowing about institutions, documents and measures on international, national and local level can be considered as a crucial prerequisite for an active participation in social processes and developments. These basics can be found in the sources section as well as in the numerous additional information boxes the ZDLs prepared. Additional information prepared by the ZDLs included for example the Common Wadden Sea Secretariat, the International Maritime Organisation, the International Panel on Climate Change, the Bundesamt für Seeschifffahrt und Hydrographie and the MarPol convention. Additionally, several ZDLs placed links to practical information for consumers, e.g. Fish & Facts @ Greenpeace and a guide to CO2-saving @ Spiegel online.

2.6 Experiences: Strong thematic focus & active guidance as a necessity

The results of this educational project, especially the information modules, have to be seen against the background of the varying complexity of topics, the external and internal factors affecting ZDLs and the organisational framework of the project.

The topics were chosen from an extensive list of topics collected for ZDL training in previous years, covering all major topics currently discussed in coastal and marine conservation in Germany. Furthermore, the choice of topics had to be of great interest to the ZDLs in order to raise their motivation. The list thus included specific anthropogenic uses in the coastal area, human impacts on the coast and further topics of great general importance in a national park (biodiversity and nature protection). As none of the ZDLs insisted to work on a topic completely different from those offered by the tutors, the ZDLs' interests were obviously met. The topics listed were of various complexities and material availability differed considerably in quality and quantity. It is obvious that e.g. marine contamination and eutrophication are much more complex with respect to causes, consequences and problems arising for the environment than marine litter. One of the tasks of the ZDLs was to get an overview of the topics and to restrict themselves to a number of relevant and manageable aspects. This is an important component of self-organised learning, and the majority of ZDLs succeeded in doing so.

As all ZDLs worked at different locations (field stations, educational centres, administrative offices), everyday duties allowed for varying degrees of extra activities. On average every ZDL worked ten hours for the project after the seminar. This corresponds to the calculation in the project concept. Out of those who worked less than the average, three judged this time effort to be too high. Out of those who spent more, another three found this to be too much. Two thirds found the time effort spent either adequate or small. These results of the online questionnaire show that personal priorities and interests also play a large role in the project work. The fact that 35 out of 42 ZDLs did hand in a product can be considered as a success, as this number is distinctly above the number of project works usually completed during ZDL-seminars during the past ten years. Usually between 40 and 65 % of all participating ZDLs handed in a written report about a project work topic. The tutoring effort invested in this project obviously motivated the participants to work harder on their information modules and to produce more output.

The quality of texts produced for the internet modules cannot be compared with texts produced by ZDLs on these topics in former years, as working directives were different in the past (two pages of text only, no layout or links etc.). Stylistic writing quality seems to be independent of tutoring effort, at least at the level of tutoring reached in the present project. A rough impression was, though, that the

texts produced in 2006 were longer but of no better logical or semantic quality than those handed in earlier years. Still, the quantity of text delivered is probably a good indicator of intellectual effort and learning effect the ZDLs underwent during the project.

Some of the problems encountered can be overcome by setting a more specific focus for the individual project work. As to this pilot project, the topics offered were formulated very generally, following the common practice of previous years. However, the overall target of producing a comprehensive information system within this project required a high degree of self-organisation and coordination of all ZDLs, as several subtopics were to be treated within each topic. Not all groups succeeded in this, even though the tutoring supported the process by individual planning talks. Therefore, topics should be restricted to a manageable degree by tutors.

A similar problem, also related to self-organisation, was that many ZDLs worked in parallel on separate chapters rather than compiling one concise text document - as during previous project work – to be put online. This resulted in overlapping contents in different chapters and doubling of information in several chapters due to some disorientation. Those ZDLs who compiled texts in a separate document before putting it online, generally produced modules structured better than those who developed their chapters online. Even though a work schedule including milestones and time frames was presented during the seminar, most ZDLs did not follow these structuring elements. This was partially caused by a rather informal supervision through the tutors. It can be concluded that the educational concept offered basic elements to support self-organisation, but their application needs to be reinforced more vigorously by the tutors.

3   Environmental education »online«

3.1 E-learning & environmental education: Do they fit together?

Modern environmental education directed towards sustainability should use a combination of established and new methods. The evolving culture of teaching and learning in the information society is said to be e-learning (Krebs 2007). E-Learning can be understood as "learning supported or enabled by information and communications technology" (ICT) (Aurorengruppe eWriting 2002). Another definition focuses on the role of the major medium for e-learning, terming it "internet-enabled learning" (Minass 2002). These definitions are but two of numerous definitions applied to e-learning, most of which refer to digital tools supporting the learning process rather than to the process itself (Krebs 2007). The majority of software developed in the context of e-learning - e.g. CBT (computer based training) programmes, content catalogues, digital simulations and games - aim at presenting and distributing learning content to and among learners by use of new media such as DVDs, CDs and the world wide web. However, next to the knowledge-transfer through various media, it is the active use of media which offers many chances in environmental education (Echtermeyer & Kloos 2004), and consequently in ESD. Working actively with media provides the opportunity to deal in depth with one's own surroundings and to apply media as a means for targeted creative processes (Schell 2003). The production of media publications motivates and compels the producers to get profoundly committed to a topic; such a process expects the participants to commit themselves voluntarily, to work independently and to be responsible (Echtermeyer & Kloos 2004). In this context, the online medium creates a unique environment for learning (cf. Anderson 2004). The most compelling feature of online learning is the ability to individually choose time and place of the learning process, thus allowing for personalised schedules. The second feature is the capability to process digital contents of various formats (multimedia, graphics, texts and others). Thirdly, huge repositories of content, which where previously available only in large libraries, can be accessed from any work place. These possibilities offered by new media can be a valuable extension of conventional environmental education.

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3.2 The software tool *IKZM-D Lernen*: A possible means for ESD

The tool IKZM-D Lernen is a software which enables authors with general computer skills but without specific knowledge in programming to place information on internet pages in the form of information modules. It was designed as a simple tool which requires only a short technical introduction of 15 to 20 minutes to enable the user to start working. Both German and English operation menus are offered. As the tool is accessible via internet, it can be used worldwide.

Figures 2 – 4 give an overview of the general components of information modules, the author environment and the editing functions.

Figure 2: Basic components of online modules compiled with IKZM-D Lernen:
(1) – content menu for navigation
(2) – large size pictures
(3) – additional information*
(4) – text paragraphs
(5) – full text search
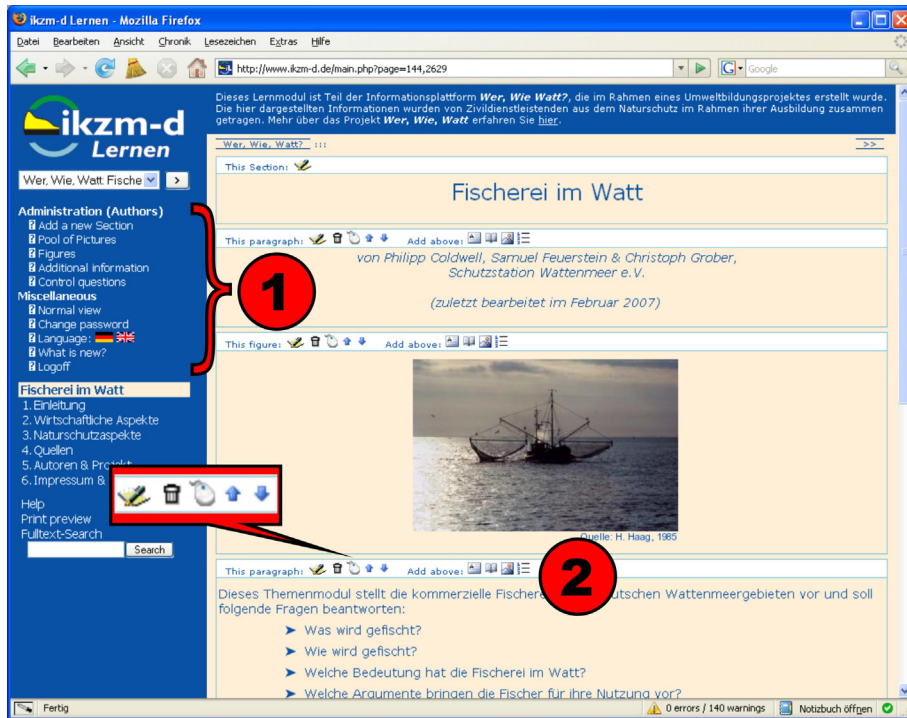* All basic file formats and URL are supported (pdf, jpg, mp3, avi, and pps).

Figure 3:   The author environment of *IKZM-D Lernen*:
(1) – administration menu
(2) – editing functions for paragraphs
All information can be arranged in an unlimited number of chapters and subchapters, as defined by the author. Each chapter consists of individual paragraphs comprising text, additional information or an image. Each paragraph is handled separately and can be edited, deleted, expanded by additional information or moved within the chapters.
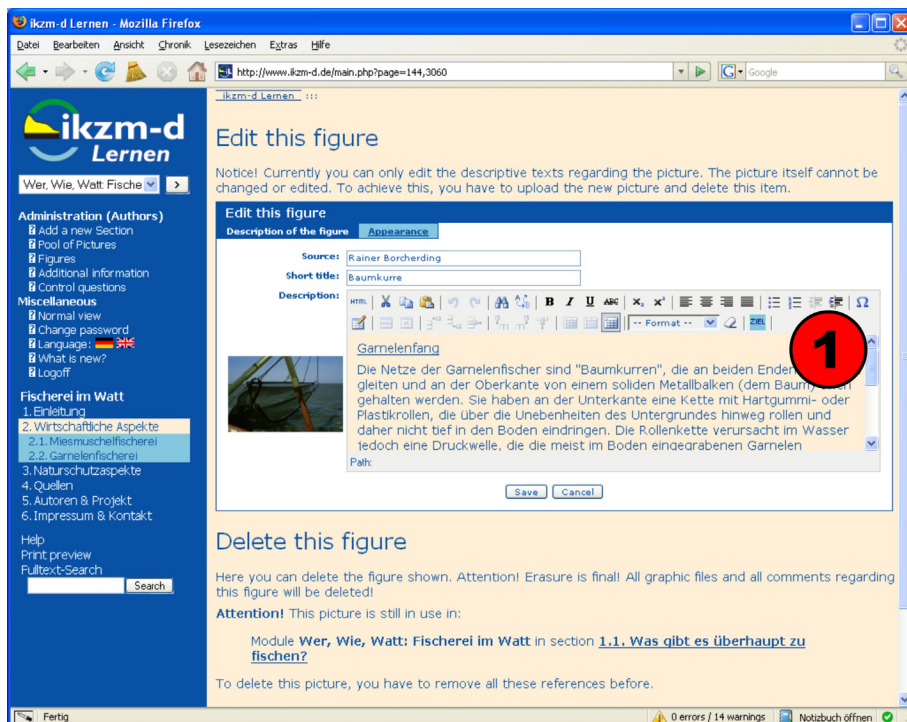

Figure 4:   The editor for insertion of texts
The html-editor TinyMCE (1) is used for inserting text paragraphs and describing figures. It allows for a limited number of formating options. Concise, well-arranged web pages can thus be easily produced in a consistent manner.

The module layout is simple to allow for quick orientation. All additional information (multimedia files, weblinks, images, documents, and descriptive texts) is offered as a small standard layout click-box which directs to new windows. This form was chosen in order to facilitate systematic and focused reading rather than distraction by an oversupply of information. A print-out version shows all information in one html-page, and a full text search allows for the allocation of relevant information in all of the modules. The composition of web pages is carried out in a special environment accessible only to registered authors. The authors can switch between an editing and a reader's view. All information entered is saved in a data base, which enables the user to include automatic tables of content and move contents freely.

The tool can be applied for coastal training in a variety of contexts and functions. Version 1.0 of this software was developed in 2003 as an author tool for university long-distance education in order to enable lecturers to offer training material to students in an appealing and globally accessible manner. The first study module offered through the tool, "Integrated Coastal Zone Management", was presented in Schernewski & Bock (2004). During the second development phase within the BMBF-project ICZM-Oder, additional technical features were developed, including the html-editor described above, an authors' guide and a module specific search function. After the implementation of the editor, it was possible to utilise the tool in a second application: as a means for the documentation of learners' study work. It was successfully tested with university students at the bachelor and master levels, but is designed to serve other learner groups as well. The software was evaluated by Klein (2006), and its functionality can be tested at http://www.ikzm-d.de/test.

3.3 Experiences of applying the software tool

The software application had some positive effects on the ZDLs and their project work. Ten out of 18 ZDLs stated that the public presentation of their project work in the internet raised their motivation for the project work itself, while only one stated that his motivation decreased. The reasons for a rise in motivation were connected mainly to the fact that the ZDLs consider the internet to be a suitable medium for passing on information to a broader public. More than half of the ZDLs found it important that the presentation of information via the internet was more appealing to the reader than a mere text document, indicating that they especially value additional information options of the tool.

The application of additional information can be considered as an indicator for the technical abilities of ZDLs. Altogether 274 additional information boxes were created by ZDLs. The most popular additional information was pictures including diagrams and maps. In total, 135 pictures were used to "decorate" the facts presented, with two modules not using any. A large number of high quality pictures were supplied by the National Park Authority to complement the Schutzstation Wattenmeer's own collection. External links were the second largest group of additional information summing up to 91. Only one module did not present external links. Additional documents were used in ten modules, while additional texts and multimedia files were included in only five modules respectively. The large effort invested by ZDLs to include additional information shows that the majority of ZDLs did not have major problems with respect to the technical skills required.

In the self-evaluation of computer skills, most ZDLs confirmed that the tool was easy to use: only two out of 18 ZDLs would have wished for a more detailed instruction than the one given during the course. However, only ten out of 18 termed the tool to be good or very good. This may be due to the fact that technical difficulties occurred in several cases. Seven ZDLs reported recurring problems during the input of information. The problems were in all but one case related to either a slow internet connection or to compatibility problems with the browser or computer used. Most problems occurred when using a combination of an Apple Macintosh computer and the Macintosh browser Safari. These problems can be solved by installing the browser Mozilla Firefox. However, the majority of ZDLs had access to a windows-based PC which did not pose any problems.

4   Lessons learned

4.1 Achievements

The project met the main demands set in the framework programme for ESD in the National Park Schleswig-Holsteinisches Wattenmeer, by addressing one of the key target groups and by focusing on key topics named in the document including the aspect of user conflicts. Furthermore, it extended the methods applied in ZDL training in a way favoured by the document by setting a focus to the Internet. In this manner, training based on first-hand nature experience was complemented by the application of new media in a self-organised learning process. The project work motivated a large number of ZDLs to spend time on additional, voluntary work. The software IKZM-D Lernen proved to be a valuable tool for environmental education of high school graduate level learners. Requirements of technical capabilities were met by the majority of ZDLs, and motivation was generally raised. For these reasons, the information system produced by ZDLs in 2006/2007 is planned to be applied and further developed in future training seminars of Schutzstation Wattenmeer to document project work.

4.2 Difficulties

However, difficulties occurred during the project, which need to be considered in the conception of future educational projects with high school graduate learners. Working with new media poses additional didactic demands to the tutors, related to producing publicly available information modules. Therefore, the seminar concept should be adapted in order to cover in more detail training in the allocation and evaluation of online information resources, in structuring, compiling and presenting information units and in self organisation. In contrast to working with university students, tutoring for high school graduate learners should provide a stronger framework to facilitate focused work. This includes a strict limitation of (internet) sources to be cited, defined intermediate goals, and the formulation of a binding work schedule including guidelines for the time to allow for internet research. These topics offer possibilities to include more participative training methods, which is one demand of ESD. A reduction of the scope of topics to be dealt with would be favourable in terms of the necessary self organisational effort and can be expected to improve the quality of the products. Furthermore, the organisational framework of projects should allow for more personal supervision and interaction between the learners. For example, a second seminar at the end of the project would offer the chance for group discussions about the modules' content and composition, with high training effects to be expected. Guiding material developed to facilitate ESD based training following the framework concept will be considered more thoroughly in future projects.

4.3 Chances

During the pilot project, further chances for future educational activities were identified. As the learners spend several months in their information centres and become part of the local community, the project work carried out within their training could be of a different nature. Rather than analysing literature, the ZDLs could be given the assignment to actively deal with people in their immediate surroundings and thereby explore the different stakeholders' perspectives as found in the coastal zone. Furthermore, first experiences of individual groups of ZDLs during the project showed that exchange of the ZDLs with coastal experts from administration and research, e.g. members of EUCC-Germany, can be profitable for ZDLs and the products (access to up-to-date knowledge and additional qualified feedback). With respect to the software tool, extra components can be supplied for future projects. A possibility for mutual evaluation of the modules could support the learners in gaining a feeling for quality-related aspects of module composition and enhance motivation. Also, further possibilities of long-distance communication through the software tool would allow for a better correspondence among participants and with tutors as well as with external consultants.

Summing up the experience gained during the project presented, it can be stated that the software tool was successfully applied in environmental education with a group of high school graduate level

learners. The project approach generally complied with the aims of ESD as laid out in framework concept of the National Park. The project results were satisfactory with respect to the goals set out in the project concept, and a number of options for improvement of the training concept were identified.

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