



**BONUS**

SCIENCE FOR A BETTER FUTURE OF THE BALTIC SEA REGION



**Integrating spatial processes into ecosystem models for  
sustainable utilization of fish resources  
INSPIRE**

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## INSPIRE Overview

Process-based understanding of changes in commercial fish spatial distributions, and to disentangle the role of natural drivers and various anthropogenic impacts, is a challenging research topic with high relevance to resource management. The very recently started four-years BONUS INSPIRE project will fill in the most persistent gaps in knowledge of the spatial ecology of the major commercial fish and thereby support the effectiveness of the relevant policies and ecosystem-based management of the Baltic Sea. The project would serve as a „*framework axis project*“ which other Baltic Sea research could be related to.

INSPIRE is designed to substantially advance our knowledge on the major commercial fish species – cod, herring, sprat and flounder, which represent key elements of the Baltic Sea ecosystems. The specific objectives of INSPIRE are to:

- i. Quantify processes generating heterogeneity in spatial distributions of fish;
- ii. Quantify and map potential hazards to the connectivity between identified key habitats, and assess the impact of anthropogenic and climatic environmental changes on habitat connectivity;
- iii. Quantify the population dynamics and interactions of the fish species in a spatially explicit context;
- iv. Develop spatially explicit advice for ecosystem-based fisheries management.

INSPIRE proposes pilot ecosystem integrated surveys to resolve the habitat requirements of different life-stages of fish species by combined use of traditional methods and application of modern advanced analysis techniques. The surveys are conducted in close collaboration with local fishermen.

[www.bonus-inspire.org](http://www.bonus-inspire.org)

### Executive Summary:

The BONUS BIO-C3/INSPIRE/COCOA/BAMBI 2016 Summer School ran from August 22-26 at Sømminestation, near Holbæk, Denmark. The course consisted of a mix of lectures, hands-on statistical analyses/ modelling exercises. Ten lecturers and 23 students participated in the summer school. We also asked the students to do a 22-question survey evaluation about the course on the final afternoon before we ended. The results are attached and were overall very positive. Most satisfying is that the vast majority of the students learned a lot, and found the course motivating and stimulating.

### Modelling Biodiversity for Sustainable Use of Baltic Sea Living Resources

The setting was near-perfect: a former naval research station converted to a modern dormitory-style teaching facility located on the shore of a quiet Danish estuary with sunny, warm weather most of the week.

One of the main purposes of the summer school was to educate and train a new generation of young scientists on the challenges and opportunities that face biodiversity in the Baltic Sea and provide them with new knowledge and quantitative tools on how to model its variations and their consequences.

The course consisted of a mix of lectures, hands-on statistical analyses/ modelling exercises and discussions addressing both functional and taxonomic aspects of marine biodiversity, with emphasis on estuarine systems, using the Baltic Sea as a case study. Students learned new modelling approaches and softwares which they could take home and apply to their own research projects. And thanks to the participation of 23 students (16 women, 7 men) and 10 lecturers (4 women, 6 men), they now have expanded and developed a network of colleagues that they can interact and collaborate with in future. The students came from both Baltic and non-Baltic countries, were mostly Ph.d. students (18), with some postdoctoral scientists (4) and Masters graduates (1).

Topics covered in the course included time-space variation of biodiversity, including both functional and taxonomic perspectives at different levels of biological organisation (populations, species, communities). The course also reviewed and identified how different drivers (e. g., fishing, eutrophication, climate change, invasive species) affect biodiversity and how biodiversity levels and variations feed back to the drivers and ecosystem management policy developments. Students then had the opportunity to synthesize their new knowledge on interactions and feedbacks between biodiversity and management by working in small groups to make a short (1000 words) report and 10 minute oral presentation on this topic on the final day – a task which demanded their attention during evenings and the last day!

The students did a great job with the task, especially given the time constraints and the challenge to form cohesive work groups with people having different backgrounds and that they had not met before. Aside from the work tasks, there was time for socialising, networking, running in the nearby forest or swimming in the fjord.



Core elements of the summer school included:

1. Biodiversity dynamics in time and space (patterns of variation)
2. Drivers of biodiversity dynamics (“why does biodiversity vary?”)
3. Descriptors of biodiversity – taxonomic and functional perspectives (e. g., traits)
4. Consequences of variations in biodiversity – effects on populations, species, food webs, “ecosystem goods and services”
5. Tools for quantifying biodiversity dynamics

Learning objectives:

1. Learn ways to model variations in biodiversity due to both natural and anthropogenic drivers.
2. Demonstrate how variations in biodiversity affect species interactions in foodwebs
3. and the provision of ecosystem services and products.

4. Quantify how natural and human ~~and~~ induced perturbations functional descriptors of biodiversity for major taxonomic groups in the Baltic Sea (e. g., fish, benthos, plankton).
5. Learn the key Baltic and European biodiversity policy and governance frameworks, and how supporting data can be collected and applied.
6. Learn sources of data for analysing variations in biodiversity in the Baltic Sea.


Participants:

	<b>Name</b>	<b>Affiliation</b>	<b>Country</b>
1	Laura Briekmane	University of Latvia	Latvia
2	Joanna Całkiewicz	University of Gdańsk	Poland
3	David Costalago	Stockholm University	Sweden
4	Romain Frelat	University of Hamburg	Germany
5	Johanna Gammal	University of Helsinki	Finland
6	Edgaras Ivanauskas	Klaipėda university	Lithuania
7	Marlene Jahnke	Stazione zoologica Anton Dohrn	Italy
8	Marie Järnström	Åbo Akademi University	Finland
9	Susanna Jernberg	University of Helsinki	Finland
10	Nataliia Kulatska	Swedish University of Agricultural Sciences	Sweden
11	Sara Kurland	Stockholm University	Sweden
12	Kadri Kuusemäe	University of Southern Denmark	Denmark
13	Katja Mäkinen	University of Turku	Finland
14	Jussi Mäkinen	University of Helsinki	Finland
15	Katarzyna Nadolna-Ałtyn	National Marine Fisheries Research Institute	Poland
16	Kristiina Nurkse	University of Tartu	Estonia
17	Alessandro Orio	Swedish University of Agricultural Sciences	Sweden
18	Anneliis Peterson	University of Tartu	Estonia
19	Luca Rugiu	University of Turku	Finland
20	Irene Olivé Samarra	Universidade do Algarve, Campus de Gambelas	Portugal
21	Katarzyna Spich	National Marine Fisheries Research Institute	Poland
22	Sieme Bossier	Technical University of Denmark	Denmark
23	Nicolas Azaña Schnedler-Meyer	Technical University of Denmark	Denmark

Lecturers:

Brian MacKenzie (course responsible)	Denmark
Martin Lindegren	Denmark
Stefan Neuenfeldt	Denmark
Henn Ojaveer	Estonia
Riina Klais	Estonia
Letizia Tedesco	Finland
Benjamin Weigel	Finland
Ute Jacob	Germany
Susa Niiranen	Sweden
Thorsten Blenckner	Sweden

In the following appended the detailed lecture schedule and the course evaluation by the students.

Teaching schedule for Modelling biodiversity for sustainable use of Baltic Sea living resources						
	Date					
Time	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
09:00		Welcome+ intro. - Brian	Letizia	Ben	Stefan - biodiv. Effects on fish growth	Synthesis report - groupwork
09:30		Riina - Plankton	Letizia	Ben	Stefan - biodiv. Effects on fish growth	Synthesis report - groupwork
10:00		Riina - Plankton	Letizia	Ben	Stefan - biodiv. Effects on fish growth	Synthesis report - groupwork
10:30		Riina - Plankton	Break	Break	Break	Break (10:30-45)
11:00		Break	Letizia - exercise	Ben - exercise	Stefan - exercise	Synthesis report - groupwork
11:30		Henn - zoopl-fish interaction	Letizia - exercise	Ben - exercise	Stefan - exercise	Synthesis report - groupwork
12:00		Henn - zoopl-fish interaction	Letizia - exercise	Ben - exercise	Stefan - exercise	Lunch+networking
12:30		Lunch+networking	Lunch+networking	Lunch+networking	Lunch+networking	Lunch+networking
13:00		Lunch+networking	Lunch+networking	Lunch+networking	Lunch+networking	Evaluation of reports
13:30		Henn - invasive species	Ute	Martin	Thorsten/Susa	Evaluation of reports
14:00		Henn - invasive species	Ute	Martin	Thorsten/Susa	Evaluation of reports
14:30		Student presentations	Ute	Martin	Thorsten/Susa	Evaluation of reports
15:00		Student presentations	Ute	Martin	Thorsten/Susa - exercise	Evaluation of reports
15:30		Break	Break	Break	Break	Evaluation of reports
16:00	Arrival	Riina - ZP exercise	Ute - exercise	Martin - exercise	Thorsten/Susa - exercise	Evaluation of reports
16:30		Riina - ZP exercise	Ute - exercise	Martin - exercise	Thorsten/Susa - exercise	BRM gives feedback re. Reports and reviews
17:00		Riina - ZP exercise	Ute - exercise	Martin - exercise	Thorsten/Susa - exercise	Course evaluation
17:30		Riina - ZP exercise	Ute - exercise	Martin - exercise	Thorsten/Susa - exercise	BBQ beach party
18:00		Supper	Supper	Supper	Supper	
18:30		Supper	Supper	Supper	Supper	
19:00		Supper	Supper	- groupwork discussion - update on progress, s	Supper	
19:30		Brian - intro to group synthesis	Student presentations	Henrik Gislason -global fish biodiversity patterns	Synthesis report - groupwork	
20:00		Group brainstorming for synthe	Student presentations	Henrik Gislason -global fish biodiversity patterns	Synthesis report - groupwork	
20:30						
21:00						



**Evaluation: Modelling Biodiversity for Sustainable Use of Baltic Sea Living Resources**

To answer simply check the dot beside each statement that most accurately reflects your view.

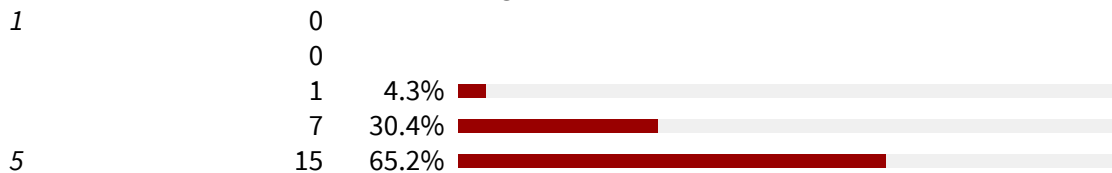
- 5 means that you definitely agree
- 4 means that you agree, but with reservations
- 3 means that you are neutral
- 2 means that you tend to disagree
- 1 means that you definitely disagree

Please answer all the questions.

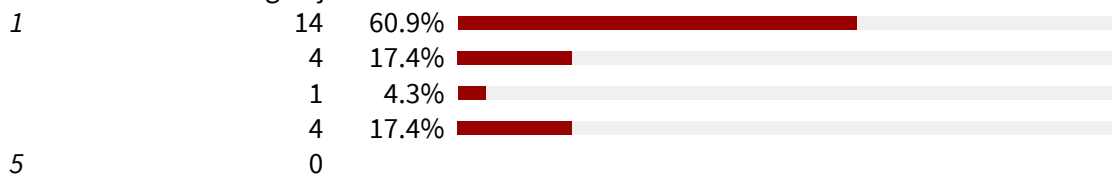
25 could answer this evaluation schema.  
 23 have answered this evaluation schema.  
 The answer percentage is 92.00%. : 23 / 25

**1**

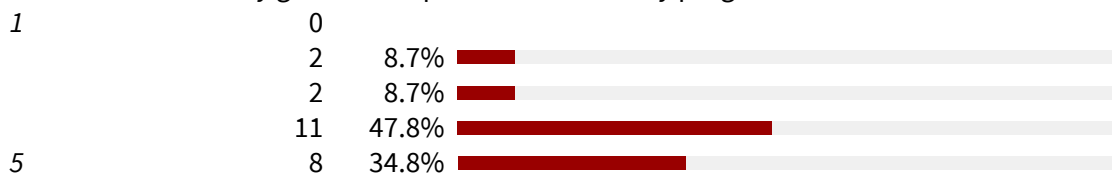
1.1 This course was intellectually stimulating



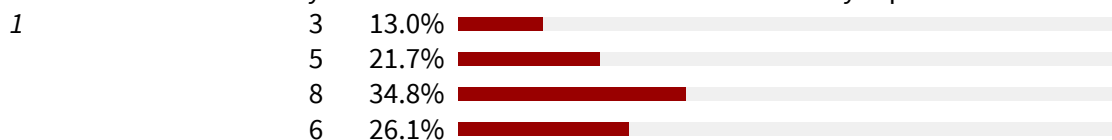
1.2 The aims and learning objectives of this course were NOT made clear

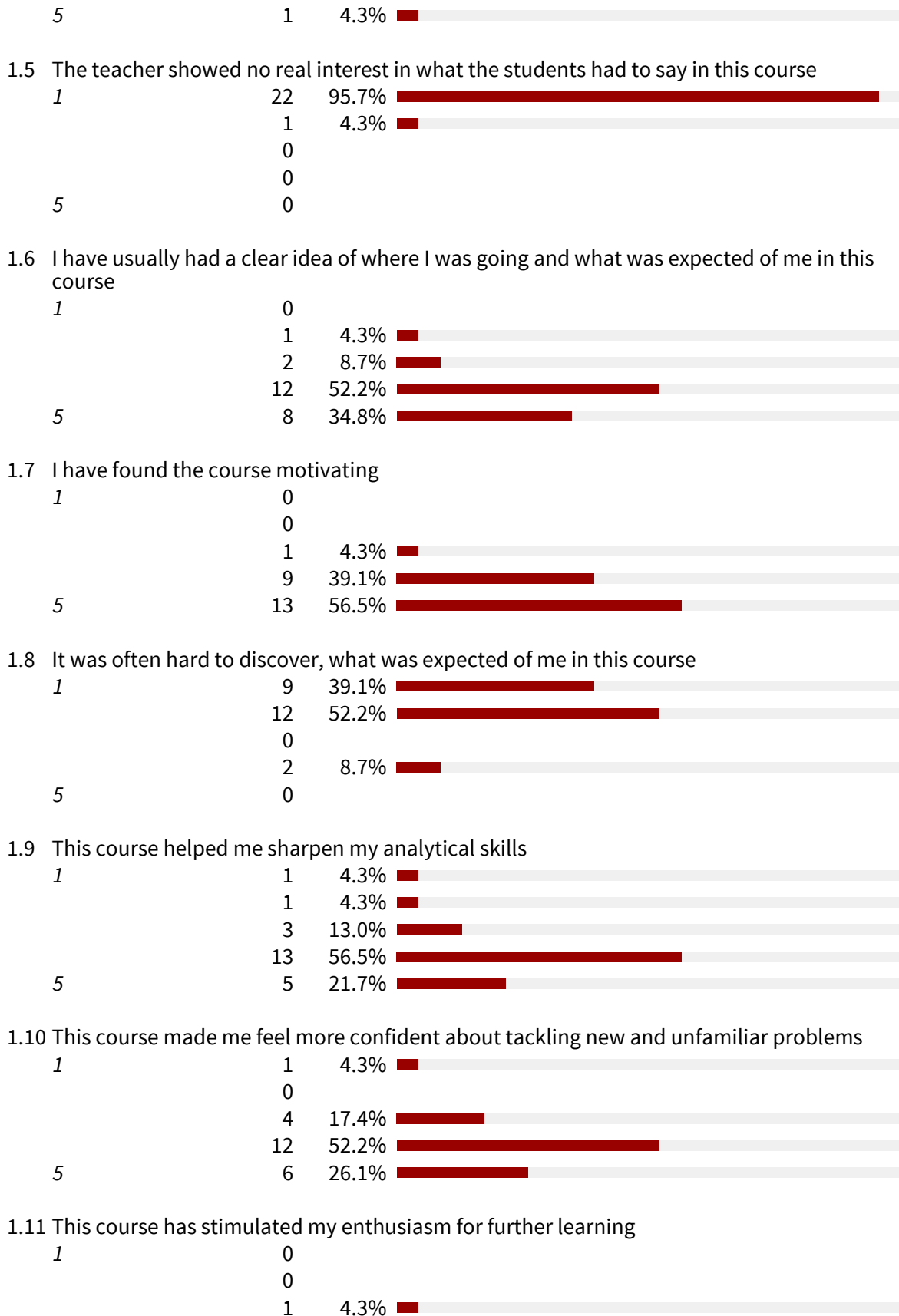


1.3 The teacher normally gave me helpful feedback on my progress



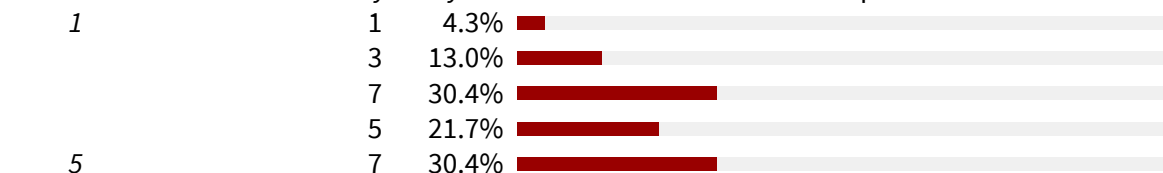
1.4 It seems to me that the syllabus in this course tried to cover too many topics



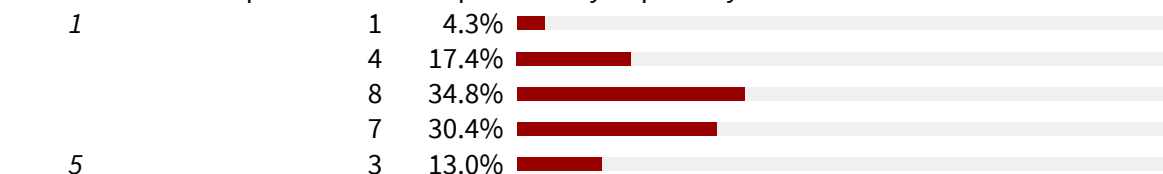




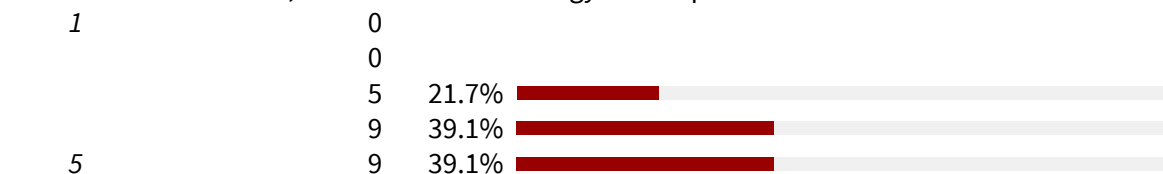
1.12 In this course it was always easy to know the standard of work expected from me



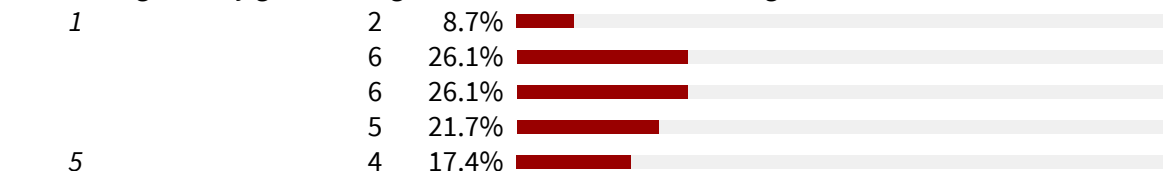
1.13 The course helped me to develop the ability to plan my own work



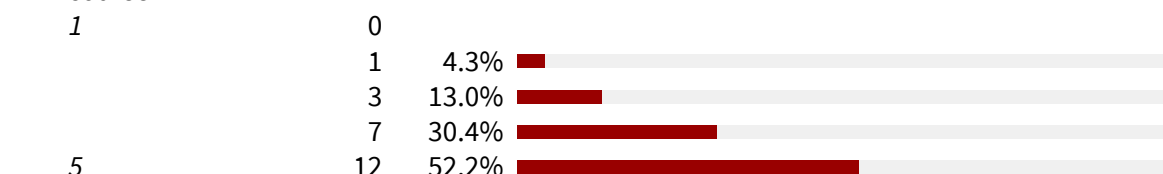
1.14 Where it was used, Information Technology has helped me to learn



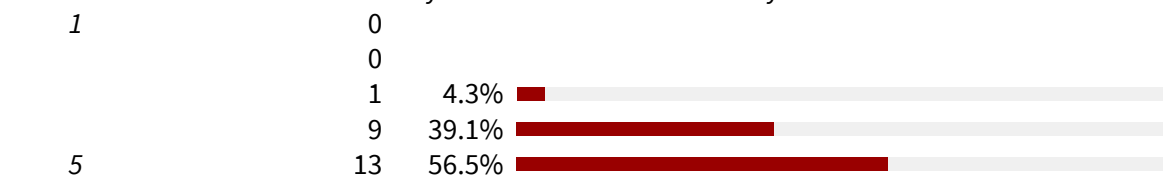
1.15 I was generally given enough time to understand the things I had to learn in this course



1.16 The teacher made a real effort to understand any problems and difficulties I had in this course

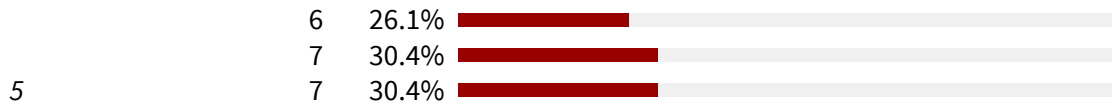


1.17 This course has stimulated my interest in the field of study

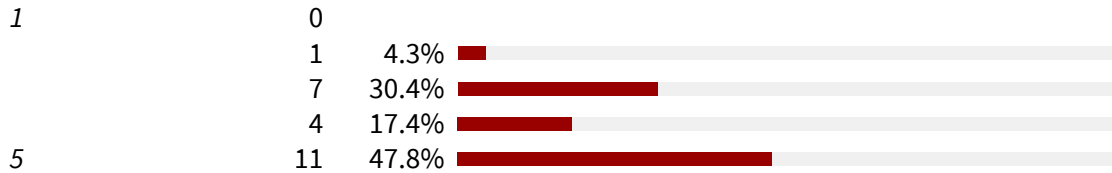


1.18 This course developed my problem-solving skills





1.19 The teacher has put a lot of time into commenting (orally and/or in writing) on my work



1.20 In this course it was made clear right from the start what was expected from me



1.21 The teacher worked hard to make the subject of this course interesting



1.22 The volume of work necessary to complete this course means that it cannot all be thoroughly comprehended

