Result 4.2

Evaluation, reports and qualified students of the degree program "Engineering in Management of Renewable Energy Technology in Buildings"

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Language

English

Content

Project Summary and Introduction

The word region is defined as “an area, especially part of a country or the world having definable characteristics but not always fixed boundaries”[1]. The Baltic Sea region (BSR) is particularly unique. While the Baltic Sea is the pivotal point defining much of the region’s characteristics and challenges, the countries are also extremely different. Geographically, they are divided between Northern, Western and Central/Eastern Europe, historically, they have been shaped by the East-West divide after the second world war. Nevertheless, given their proximity to the Baltic Sea, they have much in common.

The EU has acknowledged this by issuing the very first macro-regional strategy, the EU Baltic Sea Region Strategy in 2009. As most countries boarding the Baltic Sea were by then EU member states, it can well be considered the EU’s inland sea. The Baltic Sea Region must address current challenges, such as saving the seas, i.e. ensuring clear water, rich and healthy wildlife and clean and safe shipping. At the same time, there are opportunities for a prosperous region through co-operation measures to increase innovation, to deepen the internal market by improving transport systems, to connect energy markets and to jointly fight cross-border crime. This clearly distinguishes the Baltic Sea Region from other parts of the world.

Therefore, “BSR integration is best understood as the way that European integration has been translated into this region, further deepening and leveraging access to the rest of Europe and the markets that the EU provides”[2]

Over the past 25 years, this region has become a densely integrated, e.g. in the areas of trade, investment, labor mobility, transport and energy infrastructure as well as research collaboration. Furthermore, it demonstrates a broad landscape of robust cross-border organizations and collaborative efforts. Nevertheless, “companies do not look at the Baltic Sea Region as one integrated market in terms of their strategies. For most of them, the region remains a group of individually small markets within the EU, each with its different dynamics, rivals, and often even regulatory rules’”[3].

Keeping this in mind, the lack of comprehensive regional data collection is surprising. Therefore, as part of the Erasmus+ funded project “Promoting permeability through dual bachelor's programs with integrated initial and further vocational training” (BA&VET), an analysis of the region’s demography, economy, and labour as well as education market has been conducted. The majority of the data is taken from the

[1] Oxford Dictionary
[2] Skilling, David (2018). *The Baltic Sea Economies: Progress and Priorities*. Copenhagen: Baltic Development Forum, p.10.
[3] Ibid., p.11

Eurostat database of the European Union. When needed additional sources, such as the OECD database have been consulted as well.

Project summary

Objectives: What do you want to achieve by implementing the project?

- Increasing permeability between vocational and higher education
- Recruiting universities for tasks of further education in climate and environmental protection
- Providing excellently qualified entrepreneurs, managers and skilled workers and reducing the shortage of skilled workers to meet the challenges in climate and environmental protection
- Strengthening the productivity of SMEs through innovation support and R&D projects
- Promoting cooperation between SMEs and colleges/universities

Implementation: What activities are you going to implement?

- Analyses economy, education and labour markets and qualification needs
- Creation of solution models for 4 project countries
- Development and implementation of Train the Trainer program
- Development and implementation of 2 dual three-stage Bachelor's degree programs and 2 further trainings in climate and environmental protection
- Implementation of R&D projects in SMEs
- Quality assurance for training measures and project implementation
- Dissemination, transfer of results and implementation consultation

Results: What project results and other outcomes do you expect your project to have?

- Result report of the analyses of the economy, education and labour markets and qualification needs
- Solution models for four project countries
- Complete train-the-trainer program
- Module manuals with all documentation for two dual three-stage Bachelor's programs in climate and environmental protection
- Two further education programs in climate and environmental protection
- R&D projects implemented in SMEs
- Quality manual and results reports
- Manual, result videos and broad regional transfer of results

Objectives, results and target groups

The main objectives of the project are as follows:

a) Increasing the permeability between vocational education and training and higher education and thus promoting the attractiveness of vocational education and training

b) Strengthening the recruitment of colleges/universities for the important tasks of continuing education in climate and environmental protection

c) Providing highly qualified entrepreneurs, managers and skilled workers who, in addition to good theoretical knowledge, also have practical competences, skills and professional experience in climate and environmental protection and reducing the shortage of skilled workers to cope with the very large tasks in the energy, climate and environmental sector.

d) Attracting entrepreneurs and executives who have all the skills to successfully run a company and perform high-quality tasks in climate and environmental protection

e) Strengthening the productivity and competitiveness of enterprises through knowledge and technology transfer, promotion of innovation and implementation of manageable R&D projects

f) Promoting cooperation between SMEs and colleges/universities, strengthening colleges/universities to implement dual courses of study on climate and environmental protection, and promoting entrepreneurship in higher education.

In pursuit of these objectives, the following results will be achieved:

1. Analysis results on the economy, demography, education and labour markets as well as qualification needs in climate and environmental protection

2. Curriculum, Teaching materials, implementation report and evaluation concept and report for teacher training

3. Module handbooks with integrated continuing education, teaching materials, examination regulations, implementation reports as well as evaluation concept and reports for a three-stage dual Bachelor's degree program

- "Business Administration & Sustainable Management of SMEs"
- "Management of renewable building energy technology"

4. Concept for promoting innovation by SMEs and evaluation concept and report

5. Concept for innovation promotion of SMEs and R&D projects carried out for SMEs

6. Concepts and report for the evaluation and quality assurance of qualifications and R&D subsidies as well as project implementation, transfer of results, implementations and implementation consultations

The primary target groups of the project are:

a) School leavers who wish to combine vocational education and training with a bachelor's degree and thus receive excellent employment and professional career opportunities.

b) Students who are qualified in higher education and university and at the same time in a company and who are highly welcome in SMEs as managers and professionals or as independent entrepreneurs.

c) Owners, managers and specialists of SMEs who are qualified in continuing vocational training, acquire tailor-made competences and skills for high-quality activities in climate and environmental protection and achieve a recognized continuing vocational qualification.

d) SMEs that attract suitably qualified young entrepreneurs, managers and specialists, receive innovation funding and carry out R&D projects together with colleges/universities.

The project addresses the following secondary target groups (beneficiaries):

a) Colleges and universities which, in order to expand their educational opportunities in climate and environmental protection, receive all the documents and materials for two new dual bachelor's degree programs in order to meet the labour market needs and the conditions of SMEs in particular.

b) Chambers and other vocational training institutions which attract strong young people to vocational training, receive curricula for continuing vocational training modules for the qualification of SMEs and their staff, and cooperate intensively with col-leges/universities in teaching and innovation promotion.

c) Teachers, advisers and lecturers from chambers, other VET providers and colleges/universities who are qualified in Train the Trainer programs to provide high-quality further training, to carry out dual study courses in cooperation with companies as well as innovation promotion and R&D projects for SMEs at a high-quality level.

Testing and evaluation of the study program

A trial Bachelor's degree course in “Engineering in Management of Renewable Energy Technology in Buildings“ was developed, in which initial vocational training and further vocational training are integrated and which combines theory (learning at the university) with practice (learning in the company). First of all, the qualification requirements had to be analyzed, and a concept developed, discussed and agreed. Building on this, the entire work of developing the curriculum and module handbook was carried out, discussed and agreed. After this time-consuming work, there was no

time for accreditation and complete implementation during the three-year project period. However, the most important main modules were trialed, and the following objectives were pursued:

- Testing the degree program in live operation at the university and quality assurance.
- Initial qualification of students at the university and in companies.

An evaluation concept was developed for the tests and the degree program was finalized on the basis of the evaluation results. Finally, accreditations and implementations were prepared after the end of the project period.

The results of this work are presented in 4.2 Evaluation, reports and qualified students of the degree program "Engineering in Management of Renewable Energy Technology in Buildings".

Report on the implementation of main modules of the trial study programme[4]

The curriculum "Management of Renewable Building Energy Technology" was tested in Tallinn University of Technology Tartu college among students in programme Structural Engineering and Construction Management during two separate periods: from December 4 to December 19, 2024, and from May 14 to May 30, 2025. The testing aimed to assess the relevance, clarity, and impact of the curriculum modules, as well as to gather feedback for further development.

Tested modules and subjects

Module M3.1 General Basic Studies
- English for Working Life,
- Geometry
- Mechanics

M3.3 Basics of Energy, Environmental and Process Technology
- Basics of Energy Technology

M3.7 Energy efficiency in buildings and structures
- Materials and components
- Insulation

M3.9 Carbon-neutral and sustainable societies
- Air pollution Control
- Life Cycle Assesment and Carbon Footprint

Participants included first-, second-, and third-year construction students. This provided a wide perspective across different levels of learning experience and allowed for more balanced feedback on the tested content.

[4] Prepared by Krista Toom, Tallinn University of Technology, Estonia

Testing Procedure

Testing was conducted on paper, on site, immediately after the completion of each subject or module. After the sessions, responses were manually entered into an electronic questionnaire database for analysis.

An exception was made for the final subject, Module M3.7, where the test was delivered electronically via a survey link sent to students at the end of the course.

The response rate was very high throughout the testing period. Students showed consistent engagement, and only a small portion of feedback was collected through the online form, which was limited to one module.

The paper-based method ensured immediate feedback and minimized dropout.

Manual data entry required more time and resources but allowed control over data quality.

The online method used for M3.7 was less effective in terms of response rate compared to in-class paper tests.

Feedback covered both content-specific aspects and general impressions about the learning process.

Conclusion

The dual-phase testing provided valuable insights into the structure and delivery of the curriculum. Engaging students across all three academic years helped verify the curriculum’s applicability at different learning stages. The high participation rate supports the validity of the collected feedback. The testing approach confirmed that immediate, structured feedback sessions are the most effective way to gather student input.

The testing among teaching staff was conducted during two periods: December 4–19, 2024, and May 14–30, 2025. After the completion of each subject or module, lecturers completed an electronic feedback form. All lecturers who were asked to participate submitted their responses, resulting in a 100% response rate. The collected feedback provides valuable insights into the curriculum’s structure, clarity, and implementation from the educators' perspective.

Evaluation Concept[5]

Introduction

Program evaluation is an important process in higher education that aims to assess the effectiveness and quality of educational programs. This process involves the systematic collection and analysis of data in order to make informed decisions about program improvements. Recent literature presents various definitions and approaches to program evaluation. Kuh and Ikenberry (2009) describe program evaluation as a mechanism for continuous improvement in which feedback loops are established to regularly review and improve program components. According to Suskie analysis (2018) continuous improvement through programme evaluation involves not only identifying areas for improvement, but also implementing changes and monitoring their effectiveness over time. Guskey (2020) underlines that the effective programme evaluation must link student learning outcomes to specific programme components so that teachers can determine which elements contribute most to desired outcomes.

In more recent literature, Oermann and Gaberson (2020) define programme evaluation as a comprehensive assessment process that includes the assessment of curriculum design, teaching effectiveness, student learning outcomes and overall programme impact. This definition emphasises the need for a multi-faceted approach to capture all aspects of educational quality. Also Greene (2020) advocates the use of mixed methods, noting that qualitative data can provide contextual insights that explain quantitative trends and lead to more nuanced interpretations and actionable recommendations.

Researchers very often assume that the evaluation process is relevant and feasible for everyone involved. Mertens (2018) states that inclusive evaluation processes should involve different stakeholder groups to ensure that multiple perspectives are considered, thereby increasing the validity and utility of the evaluation results.

In summary, recent literature on program evaluation emphasizes its complexity and the importance of a comprehensive, outcome-oriented, stakeholder-focused, continuous improvement approach. By using mixed methods, educational institutions can ensure that their programs are effective, relevant and meet the needs of students and other stakeholders. This dynamic and inclusive approach to evaluation not only improves educational quality, but also promotes a culture of continuous improvement and accountability.

Several methods can be used to evaluate educational programs. The following are among the most commonly practiced:

[5] Prepared by: Marzena Grzesiak, Aniela Mikulska, Anita Richert- Kaźmierska and Magdalena Olczyk, Gdansk University of Technology

1. Kirkpatrick's four-stage model for educational programs evaluation consists of following steps: Reaction measures how participants respond to the program (e.g. satisfaction)); Learning assesses the increase in knowledge or skills after the study; Behavior assesses the extent to which participants apply what they learned during the study when they are back on the job and Results: examines the end results achieved by participating in a program.
2. The Phillips ROI Model is built on Kirkpatrick's Four-Level Model by adding a fifth level, which measures the return on investment (ROI) of the study program, comparing the program's monetary benefits with its costs.
3. Anderson's model of Learning Evaluation focuses on aligning evaluation with the strategic goals of the organization. It includes three stages: Identifying learning objectives, assessing learning and performance, and measuring impact on organizational goals.
4. Kaufman's Five Levels of Evaluation expands Kirkpatrick's by adding a focus on societal contributions and benefits. The levels are: input and process acquisition, application, organizational output, societal outcomes.
5. The CIRO model consist of 4 steps: Context, Input, Reaction and Output. This model is about understanding the broader context in which education takes place and evaluating both inputs (resources, materials) and outcomes.

The evaluation concept for the Management of Renewable Building Energy Technology degree program follows a mixed-methods approach that combines elements from the above models in order to tailor the evaluation to the specific objectives of the degree program. This ensures a comprehensive evaluation that covers all aspects from participant satisfaction to the impact of the program on the individual and organizational level. By employing a systematic and multi-faceted approach to evaluation, the Management of Renewable Building Energy Technology degree program can continuously improve and adapt to meet the evolving needs of its students and the industry.

The evaluation process

The following diagram (Figure 1) illustrates the evaluation process of a study program, which is divided into three different phases: pre-evaluation, evaluation and post-evaluation.

In the pre-evaluation phase, the objective of the evaluation is defined, and the method is determined. The process begins with a clear definition of the purpose of the evaluation and the selection of suitable evaluation methods. Questionnaires are developed to collect feedback from participants. The questionnaires are tested to

ensure clarity, relevance and effectiveness. Test results are analyzed to identify any necessary improvements to the questionnaires. If improvements are needed, the process is repeated to refine the questionnaires. Once the questionnaires are finalized, they are distributed to participants to gather feedback on the study program.

In the evaluation phase, if the response rate is low, reminders can be sent to participants to encourage them to complete the questionnaires. The collected feedback is analyzed and a comprehensive report summarizing the results and conclusions of the evaluation is prepared. In the post-evaluation phase, the evaluation report and conclusions are reviewed to determine whether the study program meets the established criteria and objectives. If the study program is not accepted, the recommendations from the evaluation are used to improve the program. The process may then return to the pre-evaluation phase to redesign the evaluation or to the evaluation phase to re-evaluate the revised study program. If the study program is accepted, this means that the study program has achieved its objectives, and no further action is required as part of the evaluation process.

Target groups of the evaluation

There are two main target groups: participants of the study program (students), and teachers conducting the courses. Each target group has its specifically adjusted questionnaire. The online questionnaire will be used.

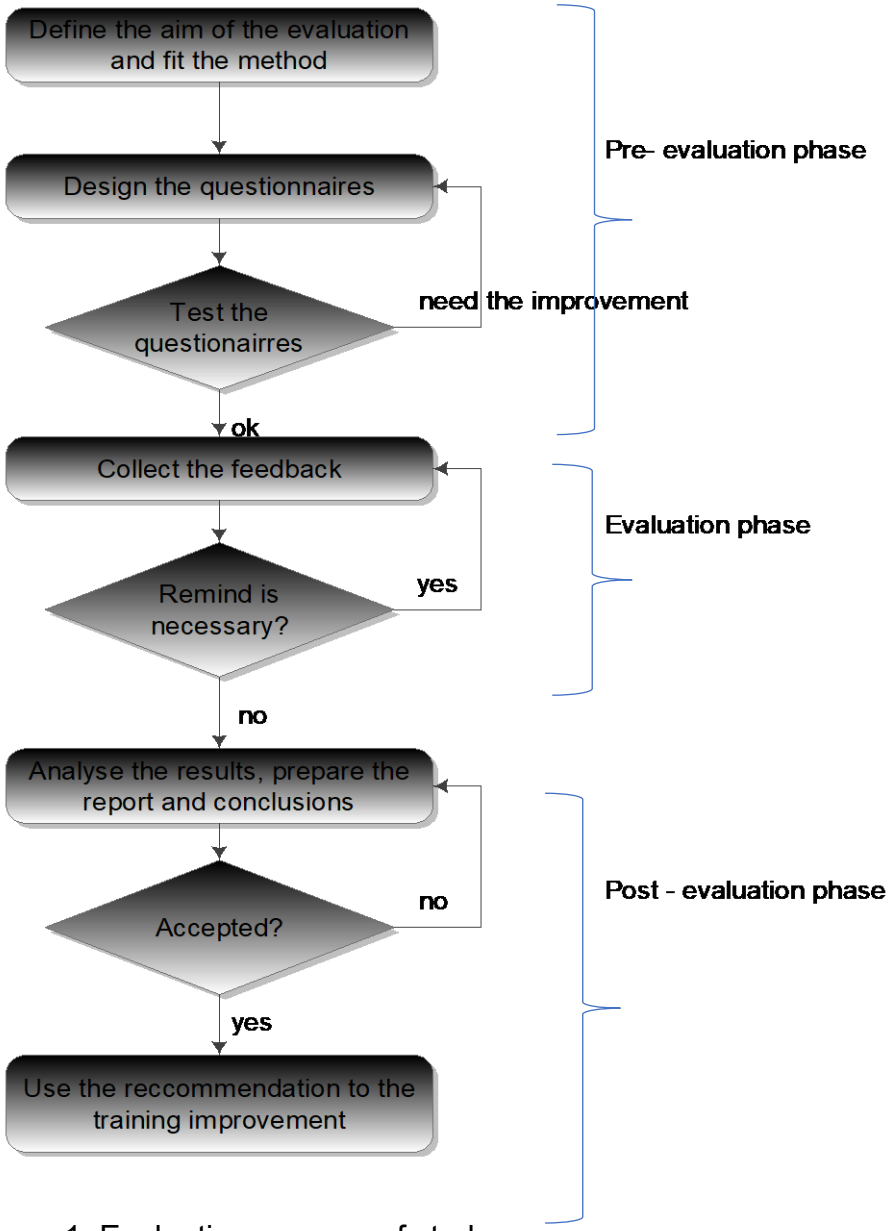

Figure 1. Evaluation process of study program

Questionnaires and duties of each test facilitator

Questionnaires for the study program (which consists of several module/subjects) are going to be prepared in paper and online versions (see Appendices). All questionnaires will be evaluated and can be modified if necessary (Table 1). Comments on the questionnaires should be sent to Gdańsk Tech by the facilitator at least two weeks before the beginning of module. The improved questionnaires will be used to collect feedback from participants. The Gdańsk Tech representative using the questionnaires will proceed evaluation of the module.

Language of the questionnaires

The module of study program will be evaluated with the questionnaires in English version.

Gdańsk Tech representative's role in the evaluation

At the beginning of the study program, the Gdańsk Tech representative will inform all participants that the modules of study program are evaluated. Participants will be informed that the evaluation helps the facilitators to develop and improve the study program at all and the particular modules.

The participants (students and teachers) will receive a link to the evaluation questionnaire or its paper version at the end of the module.

The evaluation participants will be reminded that each answer is important, and informed about the time when the online survey is active.

After the responding period ends, the Gdańsk Tech representative will collect the results from the system, analyse them, and prepare the final report.

TABLE 1: SUMMARY OF THE DUTIES, PROCESS AND SCHEDULE OF THE TEST

Deadline and responsible party	**Task**
One (1) month before the start of the study program, the facilitator should	• inform Gdańsk Tech about the schedule of the study program • inform Gdańsk Tech about number of participants in each of the module • send to Gdańsk Tech brief info about the program (**names** and **e-mail addresses** of the teachers, and **module** they will teach are required)
Within one (1) month, calculated from receiving the information listed above Gdańsk Tech will	• create the specific survey for the study program • send the links to the surveys to the facilitator and inform about the response deadline
When the module starts, facilitator will inform the participants, teachers, and enterprises that	• the module will be evaluated • the link to the evaluation survey will be given or sent at the end of the module or phase of the course • it is essential for developing the module that everyone complete the questionnaire
When the module ends the facilitator will	• deliver the links to the survey to each group of respondents (participants, teachers) either by e-mail or in another acceptable way • inform the respondents about the deadlines

	• remind the course participants about the importance of the evaluation
When the given deadline has been passed Gdańsk Tech will	• open the database and collect and analyse the results • prepare the report • send the report to be discussed

The report

The report will encompass a general overview of the respondent group, their satisfaction levels regarding facilitation, topics, teachers, and their overall group experience. Additionally, it will explore their views on the benefits of the study program and potential areas for improvement. The evaluations will be synthesized into a concluding section, summarizing key findings and offering recommendations for enhancing and developing the study program.

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Appendices

Appendix 1: Questionnaire for **participants** of the bachelor's degree "Business Administration & Sustainable Management of SMEs"

NB!!! Link to the questionnaire: https://forms.gle/zkgoFdpzDDRaqZcU8

Dear participant,

At the end of the module, please complete the following questionnaire. The questionnaire is anonymous. This will help us to continuously improve and develop the dual bachelor's study program.

General information

(1) Please indicate your gender

☐ Male

☐ Female

☐ Prefer not to answer

(2) Please indicate your age

☐ Younger than 18

☐ 18 - 24

☐ 25 - 34

☐ 35 – 44

☐ 45 – 54

☐ older than 55

☐ Prefer not to answer

(3) Please indicate which year of study are you in?

☐ First year

☐ Second year

☐ Third year

☐ Fourth year

(4) Please indicate your current professional activity

☐ I am student at the moment, not working

☐ I am a self-employed entrepreneur

☐ I am an employee in a company

(5) Please indicate your professional work experience

☐ no professional work experience

☐ 0-12 months

☐ 1-3 years

☐ 3-5 years

☐ 5-10 years

☐ more than 10 years

(6) Please indicate your educational background

☐ junior high school

☐ vocational school

☐ high school

☐ technical high school

☐ college/ university (Bachelor's Degree/ Engineering Degree)

☐ college/ university (Master's Degree)

☐ Other

(7) Did you attend any additional courses/ trainings before you enrolled dual Bachelor's Study Program?

☐ YES

☐ NO

If you answered Yes, please specify which additional courses / trainings did you attend?

_____

_____

_____

Questions about the module and the dual bachelor's study program "Business Administration and Sustainable Management for SMEs "

(8) Your opinion about the dual bachelor's study program "Business Administration and Sustainable Management for SMEs ".

Scale: 1= Strongly disagree, 2=Disagree, 3=Neither disagree or agree, 4=Agree, 5=Strongly agree

The curriculum provided sufficient practical skills for business administration of small and medium-sized (SME) enterprises	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
The curriculum provided sufficient knowledge about sustainable management for SMEs.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
The balance between theory and practical training was adequate	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

(9) Identification of the program module

Please choose the module you have completed and evaluating.

Module number	Module name	Please mark one module only
1	Scientific work and research methodology	☐
2	Business English	☐
3	Communication and consultancy	☐
4	Basics of project management	☐
5	Basics of general economics	☐
6	Basics of environmental economics	☐
7	Basics of business administration	☐
8	Human resources management in SMEs	☐
9	Sustainable Marketing	☐
10	External accounting	☐
11	Sustainable financing and investment	☐
12	Basics of commercial and labor law	☐
13	Internal accounting and basics of business taxation	☐
14	Organization and change management	☐
15	Strategic Sustainability Management	☐
16	Sustainable supply chain management	☐
17	Corporate Controlling	☐
18	Human resources development in SMEs	☐
19	Qualification of trainers in SMEs	☐
20	Cradle to Cradle and green innovation in SMEs	☐
21	Sustainable Entrepreneurship	☐
22	Business English (intensification)	☐
23	Introduction to business computing	☐
24	Reflections on practice	☐

(10) Please choose the scale that applies to your opinion on the following aspects of the module you participated.

Scale: 1= Strongly disagree, 2=Disagree, 3=Neither disagree or agree, 4=Agree, 5=Strongly agree

1. The facilitation (location, room etc.) was suitable for learning		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2. The topics and issues were relevant and responded to the goals of dual bachelor's study program		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3. The information presented were up-to-date		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
4. The presentations during the module were clear and understandable		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
5. The lecturers explained topics of the lessons, additional questions, experiences, and topical issues arisen during the course well		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
6. There were enough time scheduled for each issue.		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
7. I got valuable knowledge from lessons and examples presented by lecturers.		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
8. I believe that I can utilize the knowledge gained from lessons in my future career.		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
(11) How large was the group?	☐ Less than 10 students ☐ 10-20 students ☐ 21-30 students ☐ 31-40 students ☐ Over 41 students					
(12) Was the group size optimal for acquiring knowledge?	☐ Too few students ☐ Group size was optimal ☐ Too many students					

(13) Would you recommend the module to someone you know?	☐ Yes ☐ Maybe ☐ No Please specify if No, why?.....					
(14) Was the proportion of topics and issues inside module suitable or should something be increased / decreased	☐ The module was well balanced ☐ The module was mostly suitable ☐ The module needed better balance Please specify, what should have been balanced better…… ……					
(15) Was there anything missing from the theoretical learning that was needed	☐ Yes ☐ No ☐ Some things were missing. ☐Please specify, what was missing…… ……					

in practical training?						
(16) What was good?						
(17) What could have been done better? (E.g. was some topic missing or unnecessary)						

Thank you for your answer.

Appendix 2 Questionnaire for **lecturers** of the dual bachelor's study program "Business Administration & Sustainable Management of SMEs"

NB!!! Link to the questionnaire: https://forms.gle/Dma49cFyt4fqWzMj7

Dear lecturer,

At the end of the module, please complete the following questionnaire. The questionnaire is anonymous. This will help us to continuously improve and develop the dual bachelor's study program.

1. Identification of the program module

Please tick which module you have completed and evaluated.

Module number	Module name	Please mark one module only
1	Scientific work and research methodology	☐
2	Business English	☐
3	Communication and consultancy	☐
4	Basics of project management	☐
5	Basics of general economics	☐
6	Basics of environmental economics	☐
7	Basics of business administration	☐
8	Human resources management in SMEs	☐
9	Sustainable Marketing	☐

10	External accounting	☐
11	Sustainable financing and investment	☐
12	Basics of commercial and labor law	☐
13	Internal accounting and basics of business taxation	☐
14	Organization and change management	☐
15	Strategic Sustainability Management	☐
16	Sustainable supply chain management	☐
17	Corporate Controlling	☐
18	Human resources development in SMEs	☐
19	Qualification of trainers in SMEs	☐
20	Cradle to Cradle and green innovation in SMEs	☐
21	Sustainable Entrepreneurship	☐
22	Business English (intensification)	☐
23	Introduction to business computing	☐
24	Reflections on practice	☐

2. How long is your experience in teaching (years) ?
3. General assessments of the module
   1 = Poor; 2= Satisfactory; 3= Good; 4= Very good; 5= Excellent

The level of the overall content of module topics	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
The topics in module match to the needs and goals of the students (average)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
There was enough time to cover the planned topics	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Level of the students	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Motivation of the students	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
The content of the education match to the requirements of the qualification	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

4. Were all the necessary skills and knowledge taught during the module?

☐ Yes

☐ More or less, some topics remained uncovered

☐ No

5. What opportunities do you see for module development?

……

……

Thank you for your answer.

Evaluation Report[6]

Introduction

The Management of Renewable Building Energy Technology program is designed to equip students with the knowledge and skills necessary to understand, manage, and implement sustainable energy solutions in the building sector. As a multidisciplinary and practice-oriented educational initiative, the program aims to prepare future professionals to address emerging challenges in energy efficiency, building technologies, and renewable energy integration.
This evaluation report presents a comprehensive assessment of the program's effectiveness based on quantitative and qualitative feedback collected from both students and teaching staff. The primary objectives of the evaluation are:
a) to measure the overall satisfaction of students and instructors with the structure, delivery, and content of the program.
b) to assess the perceived relevance of the curriculum to academic and professional goals.
c) to identify strengths and areas for improvement in teaching quality, learning resources, and infrastructure.
d) to gather evidence-based recommendations for enhancing the educational experience.

The evaluation covers the full implementation cycle of the module delivered in 2024–2025 and includes data collected in June 2025. It incorporates responses from 122 student participants and 15 instructors. The analysis is based on a combination of closed-ended questions (using Likert-type scales) and open-ended feedback. Data were collected through structured questionnaires distributed online, enabling a detailed comparison of perceptions across stakeholder groups. By synthesizing these perspectives, this report seeks to inform future improvements and ensure the continued relevance, quality, and impact of the Management of Renewable Building Energy Technology program.

Student evaluation

Participant Profile Summary (Q1-Q4)

Table 1 presents a detailed overview of the demographic and professional characteristics of the participants enrolled in the Management of Renewable Building

[6] Prepared by: Marzena Grzesiak. Aniela Mikulska. Magdalena Olczyk, Anita Richert-Kaźmierska, Politechnika Gdanska, Poland

Energy Technology program. Data presented here were collected from a total of N = 122 respondents (Table 1). The data indicate that the majority of respondents are young adults between the ages of 17 and 24, with a relatively balanced gender distribution (64 male, 56 female). In terms of educational background, most participants reported having completed high school (n = 95), followed by those with a technical high school diploma (n = 13), and a smaller number holding a bachelor's or master's degree. This distribution confirms that the program primarily attracts individuals at the beginning of their academic and professional journey. Regarding work experience, 77 participants declared themselves to have no prior work experience, while 34 had between 1 and 5 years. Only a small group reported over 5 years of experience, indicating that the cohort is largely composed of pre-professional or early-career individuals.

Overall, the participant profile reflects the program's target audience: early-stage learners seeking to acquire foundational knowledge and skills in the field of renewable energy and sustainable building technologies. The relatively diverse educational paths and gender balance further suggest that the program holds inclusive appeal to a broad range of prospective learners.

Table 1. Summary Characteristics of the Participants Sample

Category	Response Option	Count
Education Level	Bachelor's Degree/ Engineering Degree	6
Education Level	Master's Degree	7
Education Level	high school	95
Education Level	technical high school	13
Education Level	vocational school	1
Work Experience	1- 5 years	34
Work Experience	5 - 10 years	5
Work Experience	More than 10 years	6
Work Experience	no work experience	77
Age	17-24 years old	114
Age	25-35 years old	4
Age	More than 35 years old	4
Gender	Do not want to answer	2
Gender	Female	56
Gender	Male	64

General Program Evaluation (Q5–Q7)

An in-depth analysis of participants' responses to Questions 5 through 7 provides strong evidence of a favorable assessment of the *Management of Renewable Building

Energy Technology* program. The total number of valid responses included in the analysis was N = 122, offering a reliable dataset for drawing conclusions about student satisfaction and program performance.

Overall Quality of the Degree Program

Among the surveyed participants, 34 individuals (27.9%) rated the overall quality of the degree program as *Excellent*, while a majority of 71 students (58.2%) selected *Good*. A smaller group, 14 students (11.5%), rated the program as *Average*, and notably, there were 3 responses indicating *Poor* quality. These results suggest that a cumulative 105 respondents (86.1%) view the program positively (Excellent or Good), which indicates a high level of satisfaction with the curriculum structure, course delivery, and instructional quality.

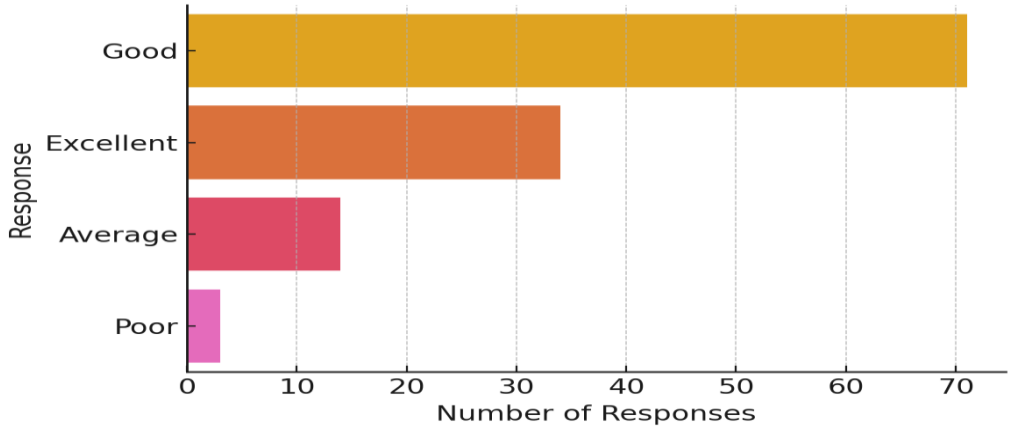
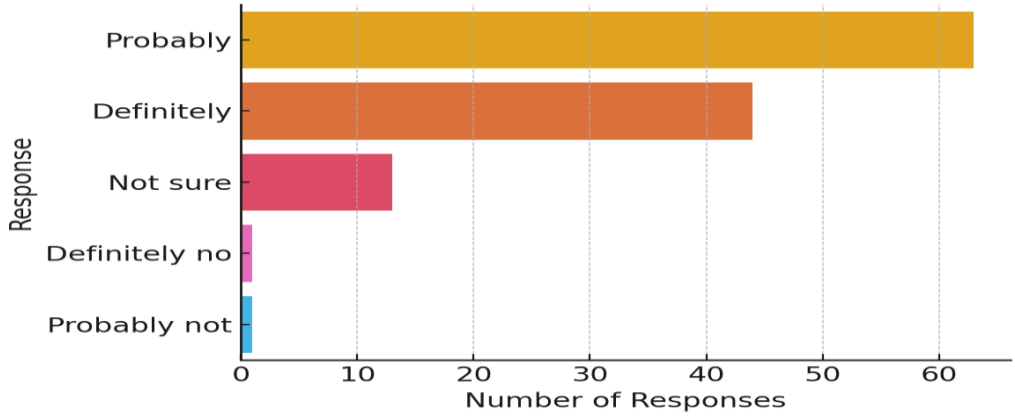


Figure 1. *Distribution of responses to the question: "How would you rate the overall quality of this degree program?" (N = 122).*

Alignment with Academic and Career Goals

Regarding the alignment of course content with individual academic and professional aspirations, 44 respondents (36.1%) answered *Definitely*, and 63 respondents (51.6%) selected *Probably*, indicating that the vast majority—107 participants (87.7%)—perceived at least a moderate level of alignment between the program and their personal aspirations. This suggests that the curriculum is broadly relevant and applicable to the anticipated professional pathways of the students. However, the difference between the 'Definitely' and 'Probably' responses may imply room for more personalized or targeted learning components, such as electives or industry-specific modules.



However, 13 respondents (10.7%) selected *Not sure*, which may reflect either insufficient clarity in how program outcomes relate to career prospects, or a lack of student awareness of potential applications. In addition, 1 respondent selected *Probably not* and another 1 chose *Definitely not*, indicating isolated but notable cases of perceived misalignment. These findings point to the potential value of:

- Strengthening career guidance and program orientation efforts,
- Expanding customizable learning paths through electives, specializations, or applied modules,
- Providing clearer communication about the professional relevance of each course component.

Improved transparency and student-instructor dialogue regarding career trajectories could further ensure that all students see a strong connection between their studies and their intended futures.

Figure 2. *Distribution of responses to the question: "How well do the courses align with your academic and career goals?" (N = 122).*

Willingness to Recommend the Program

When asked whether they would recommend the program to prospective students, 47 respondents (38.5%) selected *Definitely*, and 58 (47.5%) chose *Probably*. Combined, these figures indicate that 105 participants (86.1%) are willing to recommend the program, which serves as a powerful endorsement of its perceived value and effectiveness. This level of advocacy reflects not only satisfaction with academic content, but also with the overall educational experience, including teaching methods, instructor accessibility, learning environment, and peer interaction.

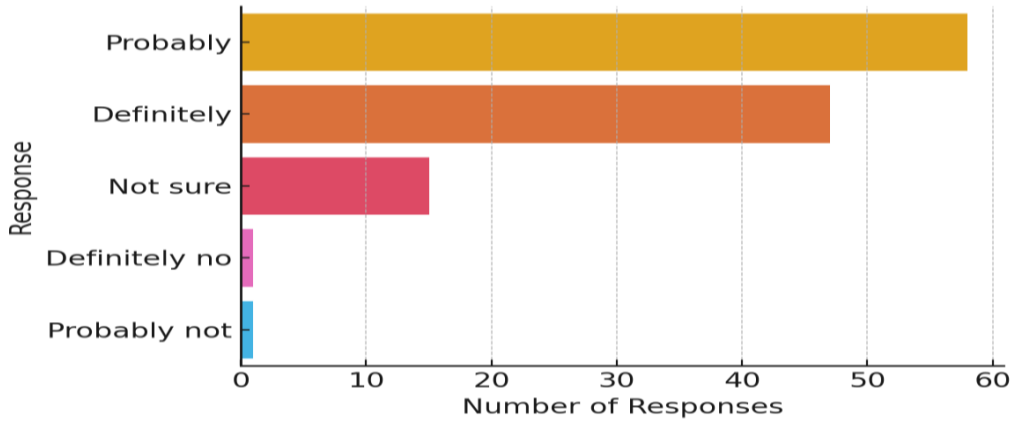


Figure 3. *Distribution of responses to the question: "Would you recommend this program to prospective students?" (N = 122).*

However, 15 respondents (12.3%) chose Not sure, and 2 respondents (1.6%) expressed reservations, selecting Probably not and definitely not, respectively. These responses suggest that while general sentiment is overwhelmingly positive, a small portion of the cohort may have experienced inconsistencies or unmet expectations in specific areas of the program. To maintain and strengthen this positive reputation, it may be helpful to:

- Collect qualitative feedback from the Not sure group to better understand their hesitations,
- Address any recurring issues related to academic support, content delivery, or practical relevance,
- Reinforce student-centered improvements to ensure consistently high satisfaction across cohorts.
- Proactive engagement with both advocates and skeptics will help ensure continuous improvement and sustain the program's credibility among prospective students.

Conclusion

Student evaluations of the *Management of Renewable Building Energy Technology* program indicate a high level of satisfaction, with 86.1% rating the overall quality as *Good* or *Excellent*. Most respondents also confirmed that the program aligns well with their academic and career goals, although 10.7% expressed uncertainty, suggesting room for clearer communication of outcomes. Furthermore, 86.1% of students stated they would recommend the program, reinforcing its perceived value and educational effectiveness. These findings highlight strong curriculum performance while also pointing to opportunities for improved personalization, guidance, and student engagement.

Evaluation of Faculty and Infrastructure

This section presents a detailed analysis of student feedback regarding faculty competence, accessibility, and the adequacy of technological resources. These factors are essential components of any educational program, particularly in technical fields where instructional quality and learning infrastructure can directly influence educational outcomes and student satisfaction.

Faculty Members Expertise

Out of 122 participants, 72 students (59.0%) selected *Agree* and 44 students (36.1%) selected *Strongly agree*, yielding a total of 116 respondents (95.1%) expressing positive agreement with the statement. Only 6 participants (4.9%) chose *Neutral*, and no responses indicated disagreement. These results confirm that the teaching staff are overwhelmingly perceived as knowledgeable and professionally prepared. In the context of a program focused on renewable energy technologies, such perceptions play a critical role in establishing trust, academic engagement, and the perceived credibility of the curriculum.

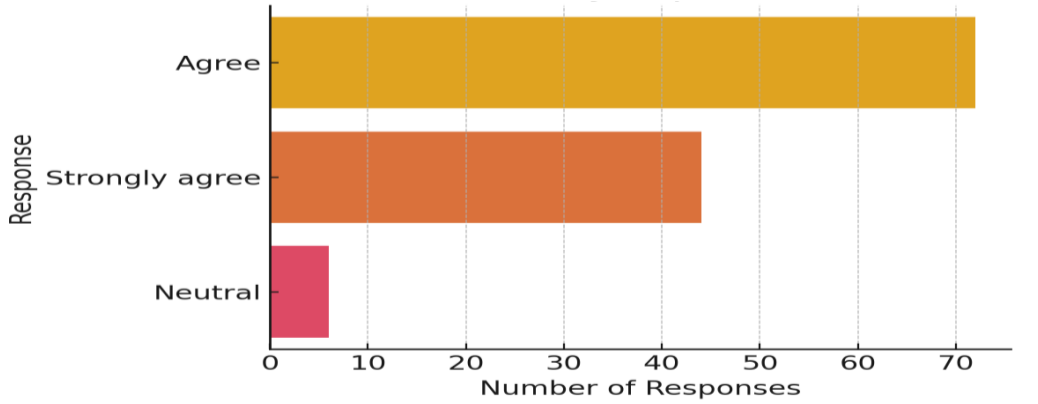


Figure 4. Responses to the question: *Do faculty members demonstrate expertise in their subject areas?* (N = 122)

Faculty Support

Student perspectives on faculty approachability were also highly favorable. 58 students (47.5%) selected *Agree*, while 53 (43.4%) chose *Strongly agree*, which together account for 111 participants (90.9%) reporting a supportive relationship with teaching staff. Only 10 respondents (8.2%) were *Neutral*, and a single respondent (0.9%) selected *Disagree*. These results underscore a consistent pattern of perceived openness and availability among instructors. Given that many students may face challenges related to language, technical complexity, or digital access, having faculty members who are seen as supportive is likely a significant factor in student retention and academic performance.

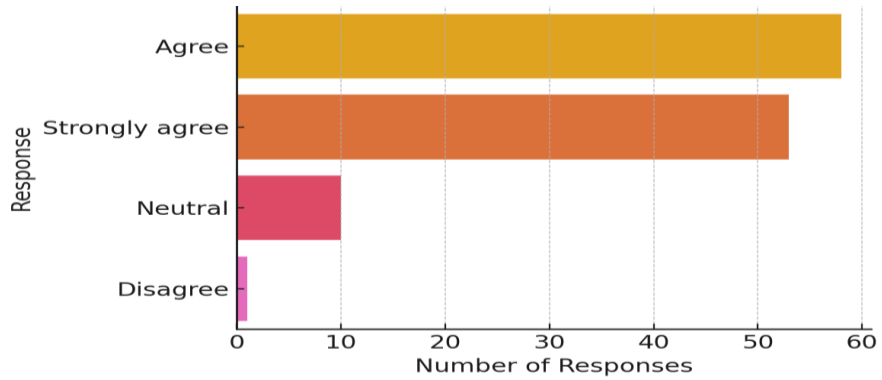


Figure 5. Responses to the question: *Are faculty members approachable and supportive outside of class?* (N = 122)

Availability and Quality of Technological Resources

In terms of technological infrastructure—including access to computers, software, and internet—57 respondents (46.7%) rated the resources as *Good*, 46 (37.7%) as *Excellent*, and 19 (15.6%) as *Average*. Notably, no responses fell into negative categories, suggesting that the technological support for learning is broadly adequate and functional. However, the relatively lower share of *Excellent* ratings indicates a potential opportunity for improvement. Investment in more advanced tools, digital platforms, or modernized infrastructure could further enhance the learning experience, particularly in online or hybrid delivery contexts.

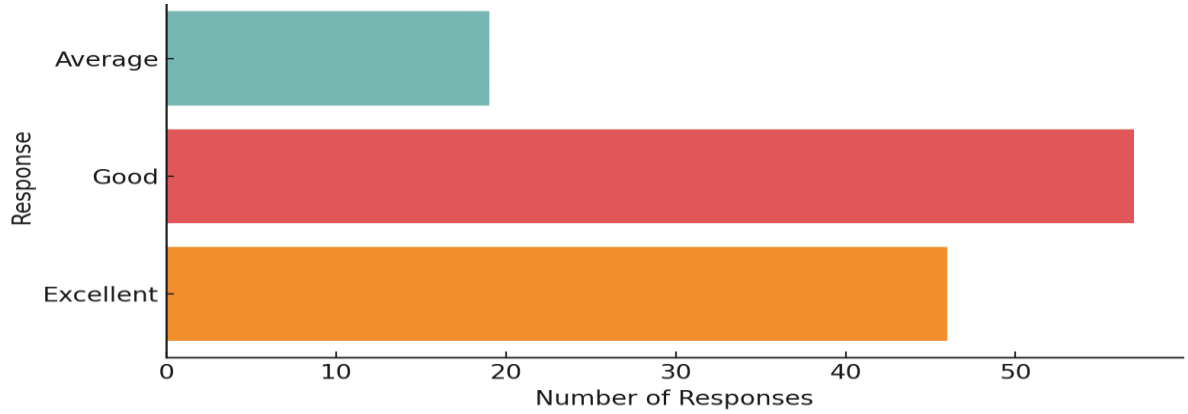


Figure 6. Responses to the question: *How would you rate the availability and quality of technological resources?* (N = 122)

Conclusions

The data from Q8 through Q10 highlight several strengths of the program. Students report a high degree of confidence in the expertise of the faculty, supported by equally strong ratings for approachability and support outside of class. This reflects a teaching environment that is both competent and student-centered. Additionally, students are largely satisfied with the technological infrastructure, although responses indicate room

for further enhancement. Taken together, these findings suggest that the human and material resources supporting the program are performing effectively, with specific areas where strategic investment could further elevate educational outcomes.

Evaluation of Infrastructure and Learning Resources

This section evaluates student perceptions of the infrastructure and learning resources provided by the program. Questions focused on the quality of library materials, adequacy of physical facilities, and the effectiveness of assessment methods. These factors are critical in shaping academic experience, especially in a technical program where hands-on learning, access to reference materials, and fair evaluation mechanisms significantly impact student success. A total of 122 responses were collected.

Library Resources

Regarding the quality of library resources, 52 participants (42.6%) selected *Good*, while 15 (12.3%) rated them as *Excellent*. However, a significant portion, 50 respondents (41.0%), rated the library as merely *Average*, and 5 participants (4.1%) chose *Poor*. These results suggest moderate overall satisfaction with library services but also reveal substantial room for improvement. The relatively low percentage of *Excellent* ratings may indicate gaps in digital databases, access to up-to-date journals, or availability of specialized textbooks in the area of renewable energy and building technology. Addressing these shortcomings could enhance research competencies, student engagement with literature, and the ability to complete coursework requiring independent inquiry.

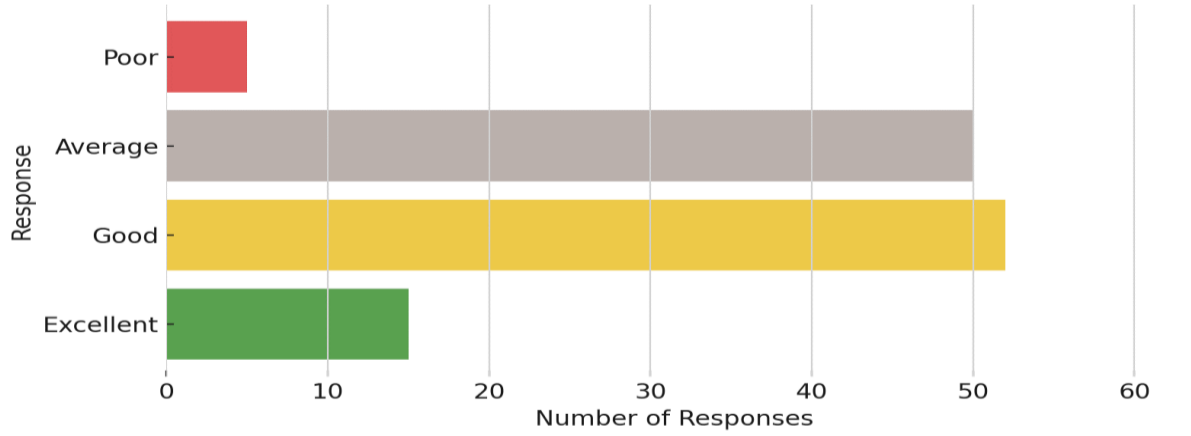


Figure 7. Responses to the question: *How would you rate the quality of the library resources?* (N = 122)

Classroom and Laboratory Facilities

A total of 75 students (61.5%) agreed that classroom and laboratory facilities were adequate and well-maintained. Additionally, 21 participants (17.2%) chose *Strongly agree*, while 25 (20.5%) were *Neutral*. Only one respondent (0.8%) selected *Disagree*. These results indicate that over 78% of students hold a favorable view of the program's physical infrastructure. Well-equipped classrooms and labs are essential for delivering modern technical education. Although the results are highly positive, the presence of over 20% of respondents selecting *Neutral* suggests the need for continuous investment in facility upgrades, especially to keep pace with technological developments and environmental standards. Enhancing air quality, lighting, safety, or accessibility may further improve learning conditions.

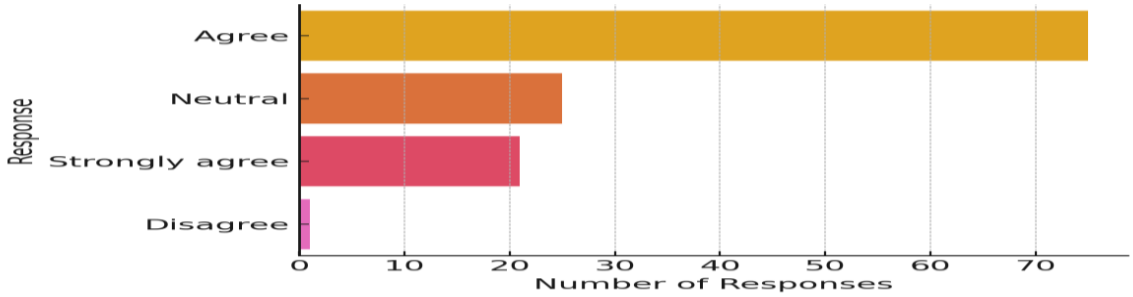


Figure 8. Responses to the question: *Are the classroom and laboratory facilities adequate and well-maintained?* (N = 122)

Effectiveness of Assessment Methods

Student evaluation of assessment practices was relatively balanced. The majority—74 students (60.7%)—found the methods *Effective*, while 13 (10.7%) found them *Very effective*. However, 33 participants (27.0%) were *Neutral*, and 2 (1.6%) considered them *Ineffective*. These results point to a general perception of fairness and adequacy in assessment design. The presence of a substantial neutral group may reflect diverse experiences depending on the course, instructor, or type of assessment used. To further enhance confidence in this area, faculty may consider increasing transparency in grading criteria, providing formative feedback, and aligning assessments more closely with stated learning outcomes and competencies. In particular, integrating applied, project-based evaluation could align well with the technical orientation of the program.

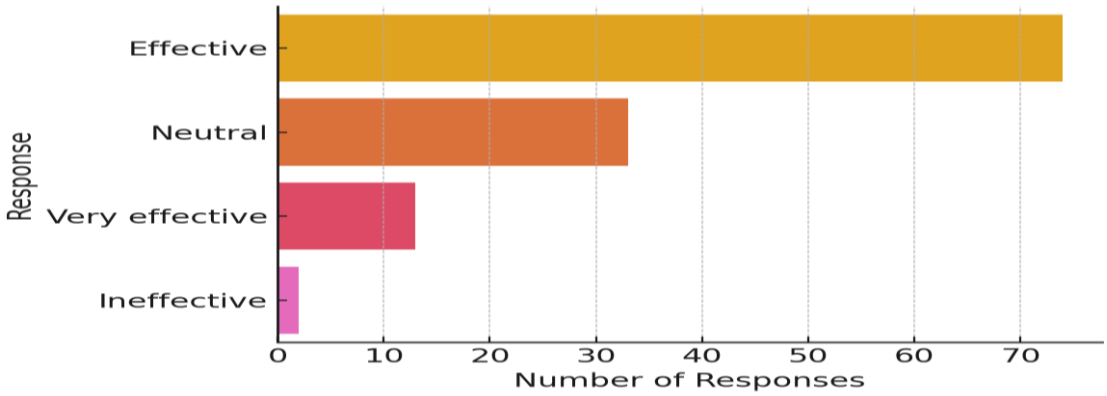


Figure 9. Responses to the question: *How effective are the assessment methods used by instructors?* (N = 122)

Conclusion: The evaluation of infrastructure and learning resources demonstrates generally positive feedback from students. While classroom and laboratory facilities receive strong approval, and assessment methods are broadly accepted, the library infrastructure emerges as an area in need of enhancement. Institutional efforts aimed at upgrading digital resources, increasing material availability, and streamlining assessment criteria could further strengthen the academic environment of the program. Continued engagement with students on facility and resource improvements, possibly through advisory boards or periodic satisfaction surveys—may foster greater alignment between educational support structures and learner needs.

Module-Specific Learning Experience

This section presents an integrated evaluation of fourteen specific components of the module, based on student responses. The heatmap (Figure 10) presents a detailed, itemized analysis of student responses to 13 statements evaluating different pedagogical and organizational components of the module. These items covered several domains, including clarity of goals, topicality of content, effectiveness of instructional delivery, interactivity, materials, and learning atmosphere. Responses were collected using a four-point Likert-type scale: Absolutely True, Quite OK, Difficult to Answer, and Not True.

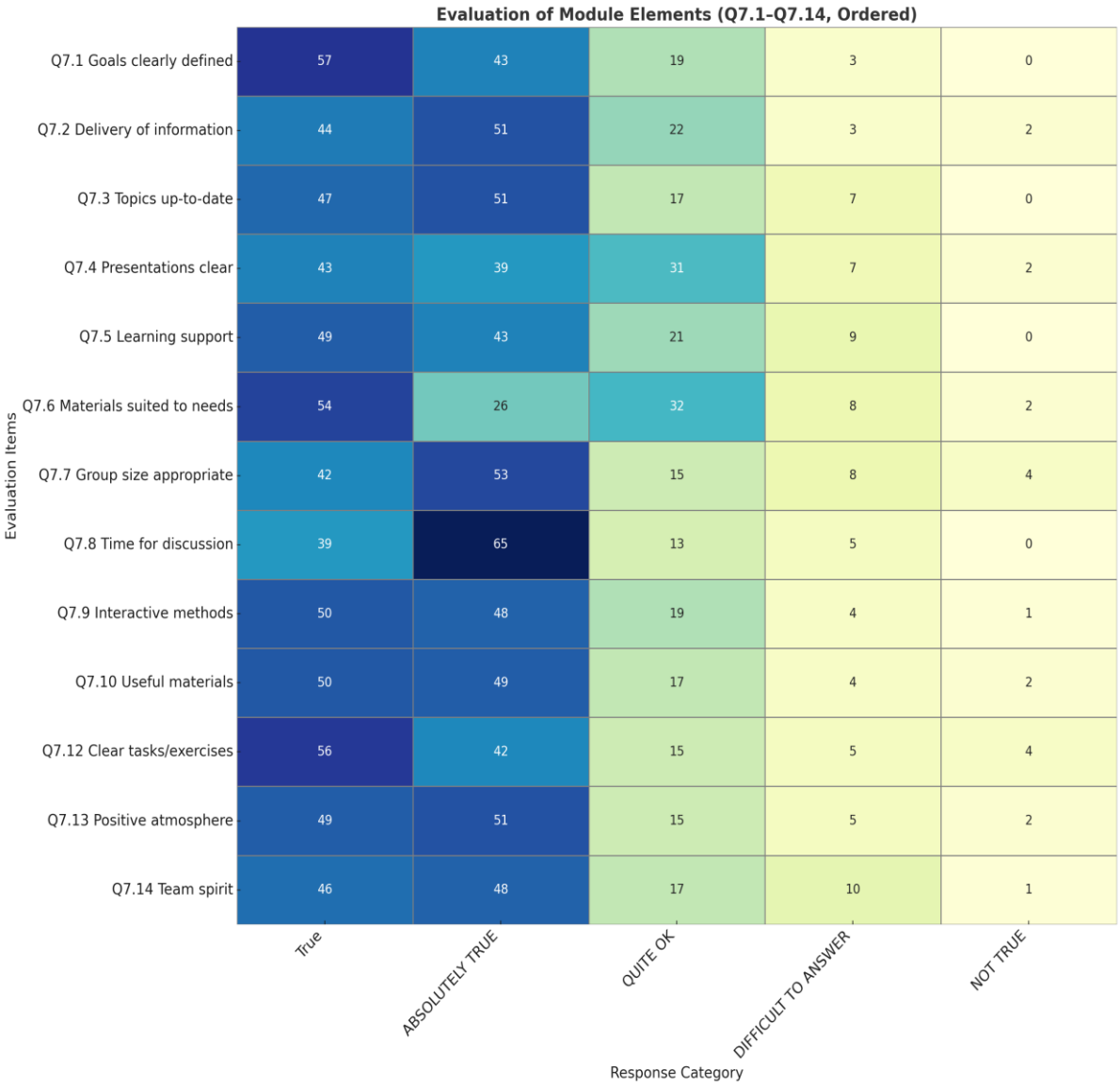


Figure 10. Heatmap of Student Evaluations on Specific Teaching and Learning Components (Q7.1–Q7.14)

Across the board, the results indicate a high degree of student satisfaction with the program. For each of the 13 statements, over 50% of the responses were positive, with a substantial share falling into the most affirmative category (Absolutely True). The highest levels of positive assessment were recorded for: “Lecturers delivered important information” (Q7.2) – with 59.8% positive responses (including 44.3% “Absolutely True”) and only 1.6% negative responses, “The presentations were clear and understandable” (Q7.4) – received 57.4% positive ratings and only 1.6% marked it as “Not True”, “The topics and information were up-to-date” (Q7.3) – showed 55.7% positive feedback and no negative evaluations.

Other dimensions such as goal clarity (Q7.1) and group size appropriateness (Q7.7) also received strong ratings, with 50.8% and 52.5% positive evaluations respectively, and almost negligible negative feedback. This pattern indicates a well-structured module with coherent objectives and effective group dynamics.

Items focused on interactivity and student engagement—including Q7.8 ("time reserved for discussion") and Q7.9 ("interactive methods")—also scored positively, though with a slightly higher proportion of neutral responses (approx. 6–8%), suggesting that while interaction is present, its implementation might vary across sessions or instructors.

Slightly lower but still favorable scores were found for support in the learning process (Q7.5) and adjustment of materials to student needs (Q7.6), where 52.5% and 53.3% respectively marked the items as positive, and 7.4% selected "Difficult to Answer" in both. These findings suggest room for improvement in personalization or communication of support resources.

A particularly encouraging finding is the overall atmosphere of the module. Statements such as Q7.13 ("The atmosphere in the module was excellent and open") and Q7.14 ("We had a good team spirit") garnered consistently high agreement, with more than 55% of students expressing positive sentiments and only 1–2% indicating dissatisfaction.

Overall, the map reveals a pedagogically robust and positively received module. All aspects show strong or very strong approval from participants. Importantly, the low incidence of "Not True" responses across all questions (rarely exceeding 2%) supports the conclusion that the program met or exceeded the expectations of the vast majority of learners. However, minor improvements in individualized learning support and opportunities for deeper interaction could further optimize learning outcomes.

Open-ended Feedback

The analysis of open-ended responses to this question reveals three key thematic categories: positive aspects of the program, areas in need of improvement, and suggestions for future development. These categories provide a comprehensive overview of participants' experiences and perceptions regarding the structure, delivery, and effectiveness of the degree program.

Strengths of the Program (What Was Good)

Respondents frequently emphasized the high quality of teaching staff. Lecturers were praised for being clear, knowledgeable, and supportive, with multiple mentions of well-structured presentations and strong communication skills. This aligns with previous closed-question responses indicating satisfaction with content delivery (see Q7.2 and

Q7.4).Another recurring theme was the practical orientation of the module. Many students highlighted the usefulness of hands-on activities, particularly in connection to real-world applications of renewable building energy technologies. Respondents valued learning experiences that combined theory with simulations or project-based tasks.

In addition, a significant number of students appreciated the positive learning environment and teamwork culture. Phrases such as “friendly atmosphere”, “good group spirit”, and “supportive classmates” were cited, suggesting that both peer interaction and course structure fostered collaborative learning.

Areas for Improvement (What Was Not Good)

The most frequently mentioned issue was related to time management and scheduling. Several respondents indicated that sessions were either too condensed or lacked consistent pacing. Some suggested that too much material was covered in too little time, reducing the opportunity for deeper engagement or reflection. Students also pointed out limited access to supplementary learning materials. While core presentations were deemed effective, there was a recurring call for additional reading lists, case studies, or online resources that could help consolidate learning outside classroom hours. Finally, a few participants expressed concern about uneven workload distribution in group tasks or exercises. Although group work was generally appreciated, some students felt that assessment criteria or task allocation could be *more transparent and equitable.*

Suggestions for Improvement

Based on the feedback, participants proposed several action recommendations:

- Extend the time frame of certain modules or introduce breaks within intensive sessions to enhance comprehension and reduce fatigue.
- Provide more digital materials, such as video recordings, summaries, or access to external learning platforms.
- Clarify learning objectives and assessment rubrics for group assignments to ensure fair participation and clear expectations.
- Encourage even more interactivity by increasing the frequency of discussions, workshops, or peer reviews.

Many students closed their responses with positive remarks and the expression of willingness to recommend the module to others, indicating a generally strong appreciation for the program despite some operational limitations.

Teachers evaluation

Teacher Sample

The teacher survey was conducted among academic staff participating in the Management of Renewable Building Energy Technology study program (see Table 2).

Table 2. Summary Characteristics of the Teacher Sample

Category	**Most Frequent Response**	**Number of Responses**	**Other Notable Responses**
Education Level	Doctor or resp.	12	Master of Science, Master of Arts
Profession	Teacher	10	Researcher, Consultant, Lecturer, Associate Professor
Teaching Experience	More than 20 years; 11–20 years	6 6	6–10 years,
Age	30–60 years old	12	More than 60 years old,
Gender	Female	10	Male

The teacher survey was conducted among academic staff participating in the Management of Renewable Building Energy Technology program. A total of 15 instructors responded, forming a professionally diverse group with substantial teaching experience and strong academic credentials. In terms of education, 12 respondents (80%) held a doctoral degree or equivalent, while 3 (20%) had a Master of Science or Master of Arts. The professional roles reported included teachers (10 respondents), researchers, consultants, lecturers, and associate professors, indicating a wide spectrum of academic and applied expertise. The most common range of teaching experience was more than 20 years (6 respondents), followed by 11–20 years (also 6 respondents). This suggests a faculty cohort that combines senior-level experience with generational variety. Twelve respondents (80%) were between 30 and 60 years old, one person was over 60, and two participants did not disclose their age. Gender distribution was balanced, with 10 female (67%) and 5 male (33%) instructors. Overall, the teacher sample appears highly competent, academically active, and capable of offering informed and multidimensional evaluations of the study program.

Teaching Conditions

The combined figure 11 presents the distribution of responses from 15 instructors regarding three core dimensions of teaching conditions: (6a) the availability and quality of teaching resources, (6b) the level of administrative support, and (6c) the sufficiency of preparatory information for module delivery.

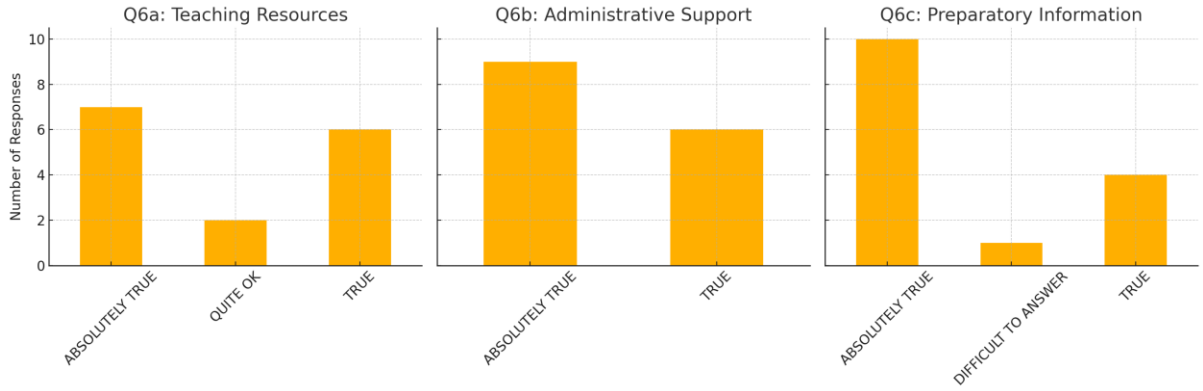


Figure 11. Evaluation of Teaching Conditions

In the evaluation of teaching resources (Q6a), responses were generally positive but somewhat dispersed. A total of 7 instructors (47%) selected “Absolutely true”, 6 (40%) chose “True”, and 2 (13%) responded “Quite OK”. No respondents indicated “Not true”. This distribution suggests a favorable overall perception of the availability and quality of teaching resources, though the presence of moderate ratings points to some variability in access or consistency across modules.

Feedback on administrative support (Q6b) was uniformly positive. Nine respondents (60%) selected “Absolutely true” and six (40%) answered “True”, while none chose either “Quite OK” or “Not true”. These results highlight a strong institutional infrastructure that is widely regarded as responsive and supportive of instructors' needs.

The evaluation of preparatory information (Q6c) also produced a highly positive outcome. Ten instructors (67%) answered “Absolutely true” and four (27%) selected “True”. One respondent (7%) indicated “Difficult to answer”, while no one chose “Quite OK” or “Not true”. This suggests a high level of satisfaction with the information provided in advance of module delivery, although the single uncertain response may hint at occasional gaps or ambiguities in the preparation process.

Overall, the results from Q6a to Q6c indicate that the program is well-supported in terms of teaching conditions. While administrative and preparatory support appear exceptionally strong, the slightly more varied responses regarding teaching resources may point to opportunities for selective enhancement or more uniform provisioning across the curriculum.

Student Evaluation

General Evaluation of Students' Preparation (Q7)

Teacher responses regarding the general level of students' preparation: both in terms of prior knowledge and interest indicate a moderately positive yet differentiated picture. Most respondents (60%) rated students as Good, while a notable group (33%) selected Fair, suggesting room for improvement. Only one instructor (7%) assessed the preparation as Excellent. No responses indicated low readiness (e.g., Poor or Very poor).These results imply that although the overall baseline is satisfactory, pre-course familiarity and academic engagement vary across the student body. The presence of Fair ratings underlines the importance of ensuring consistent entry-level competence, particularly in a multidisciplinary program. To enhance student readiness, program coordinators may consider: distributing preparatory learning packages, clarifying module prerequisites and expected entry skills and implementing short introductory refreshers or tutorials. Such measures would support equitable participation and help align diverse educational backgrounds with the program's academic objectives.

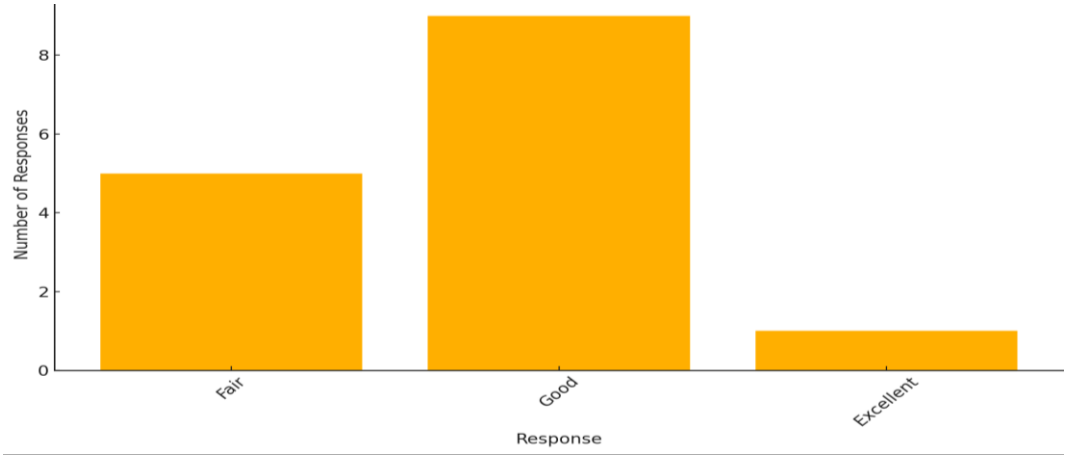


Figure 12. Evaluation of Students' Preparation

Qualitative Evaluation of Student Participation (Q8 and Q8.1)

A word cloud generated from open-ended responses regarding students' classroom reactions and participation reveals a strong emphasis on active learning behaviors (Figure 13). Terms such as "participated", "interested", "discussed", "assignments", and "completed" dominate the visualization. These keywords suggest that students were not only present but intellectually engaged, with many instructors highlighting their ability to follow through with tasks and engage in meaningful discourse.

This language points to a learning environment characterized by motivation, relevance, and interactivity. The frequent mention of "given topics", "relevant content", and "frequent discussion" also suggests that students recognized the value of the material presented and were willing to explore it critically.

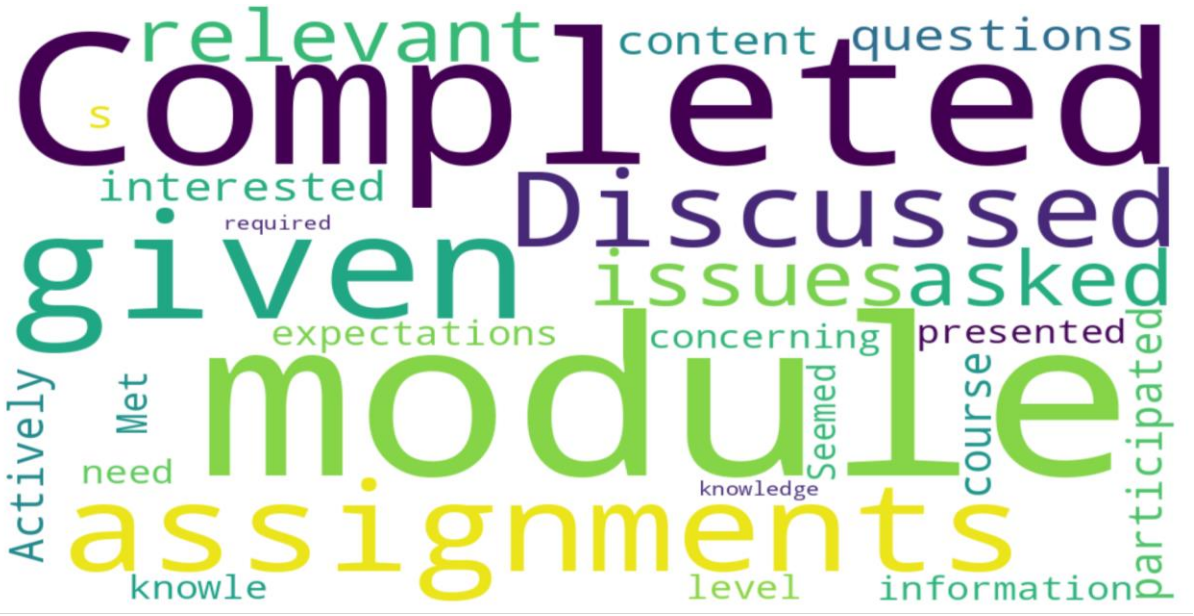


Figure 13. Word Cloud: Teachers' Descriptions of Student Participation (Q8)

Based on the content of responses, teacher feedback can be grouped into the following four profiles:

1. Engaged and Curious Learners
    - Students showed interest in the content, asked questions, and contributed actively to discussions.
    - *Keywords: interested, discussed, frequently, participated*
2. Task-Oriented Performers
    - Students completed assignments on time and followed instructions but showed limited spontaneous engagement.
    - *Keywords: completed, assignments, given topics, followed*
3. Relevance-Driven Participants
    - Students seemed to recognize the practical value of the content and responded positively to applicable themes.
    - *Keywords: relevant, need for information, useful*
4. Passive but Present Students *(minority)*
    - Indications that students were attentive but less vocal or interactive.
    - *Less commonly represented; inferred from lower emphasis on discussion/interactivity.*

This typology can help program coordinators and instructors adapt pedagogical strategies to enhance engagement across all student types, for instance by pairing task-driven structures with more exploratory discussion formats.

Evaluation of Students' Basic Knowledge (Q9)

The evaluation of students' basic knowledge (Q9) reveals a moderately favorable yet heterogeneous pattern (Figure 14). The majority of instructors (47%) rated students' prior knowledge as "Good," while 27% indicated it was "Fair." Only 13% of respondents assessed students' knowledge as "Excellent." At the lower end of the spectrum, 1 of instructors selected "Poor" and 1 chose "Very poor," highlighting that a small but non-negligible fraction of students began the course with insufficient foundational understanding. This distribution suggests that while most students possess an adequate level of entry knowledge, there remains a notable diversity in preparedness that may affect the pace and depth of instruction required in early course stages.

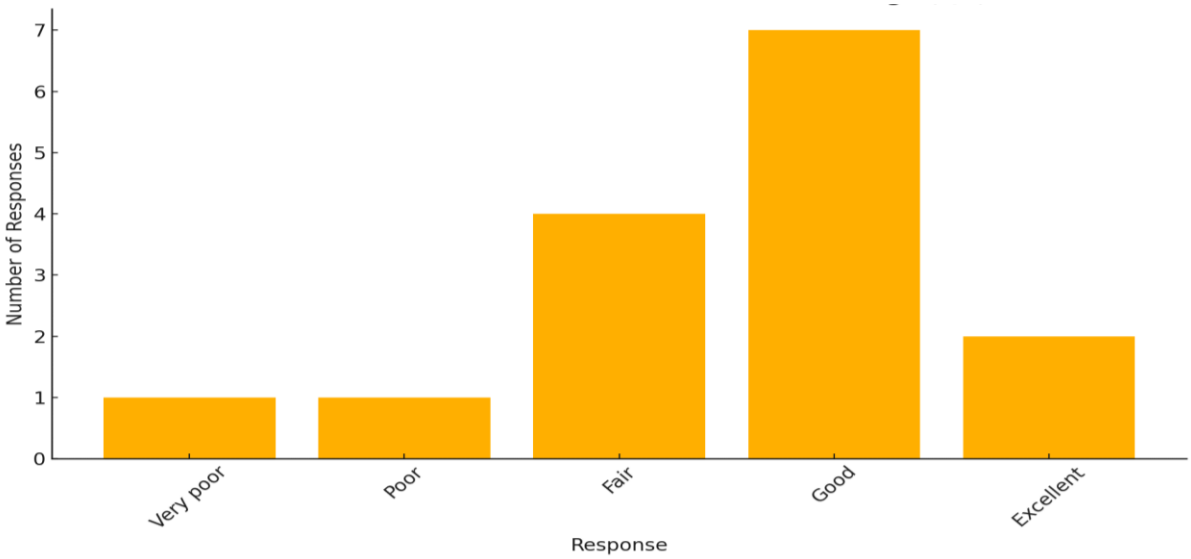


Figure 14. Evaluation of students' basic knowledge about the topic

Students' Attitudes

The data indicate a strong tendency among instructors to evaluate students' attitudes positively, with a noticeable number selecting "Good" and "Excellent." (Figure 15) This suggests that many students were perceived as respectful and cooperative in their interactions. Such interpersonal behaviors are often associated with more effective group work and a supportive learning environment. However, it is important to consider that these perceptions may vary depending on contextual factors such as group composition, course content, or instructional style.

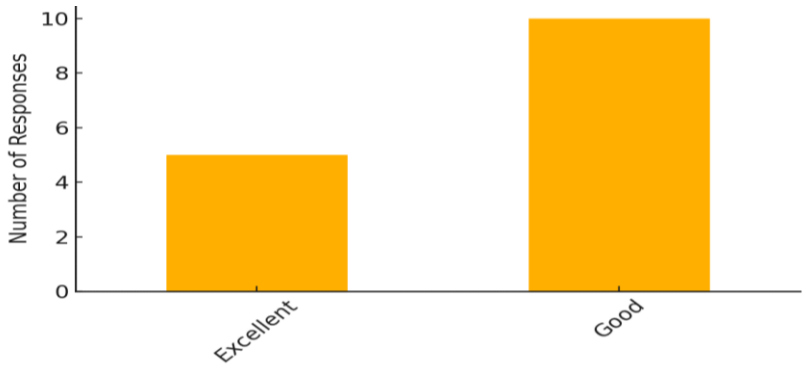


Figure 15. Evaluation of Students' Attitudes

Student satisfaction with the module

We also evaluate the overall students' satisfaction (Figure 16)

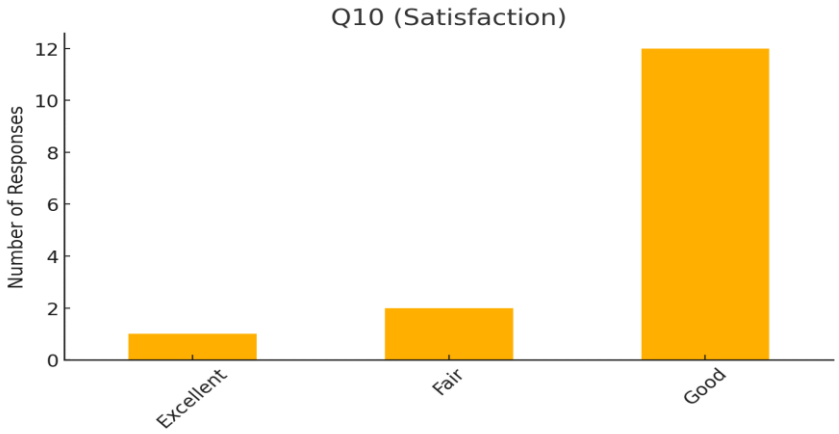


Figure 16. Student satisfaction with the module.

The evaluation of students' satisfaction with the module (Q10) reveals a generally positive perception among instructors, though with some variation in the intensity of responses. Of the 15 instructors surveyed, the majority — 12 respondents (80%) — selected "Good," indicating that most students were viewed as content with the module's delivery and structure. Additionally, 2 instructors (13.3%) rated students' satisfaction as "Fair," suggesting that while satisfaction was present, there may have been areas perceived as only moderately successful. Only 1 instructor (6.7%) selected "Excellent," which may imply that exceptional satisfaction was less commonly observed. Although no negative responses were recorded, the distribution suggests a level of satisfaction that is solid yet not uniformly outstanding. These findings point to a well-functioning module that meets student expectations in most respects, while also highlighting opportunities for enhancing certain elements to elevate the experience from "good" to "excellent" in the future.

The Instructor's Self-Assessment

In the program evaluation process, we asked instructors to conduct a self-assessment. The heatmap provides a visual summary of instructors' self-assessment concerning six aspects of their teaching during the evaluated module (Figure 17). The survey included the following items: (Q11a) I followed the module plan, (Q11b) I supported students in learning, (Q11c) The information I provided was up-to-date, (Q11d) My presentation was clear and understandable, (Q11e) There was enough time to cover all topics, and (Q11f) There was time for discussion with students. Each item was rated on a five-point scale: "Absolutely True," "True," "Quite OK," "Difficult to Answer," and "Not True."

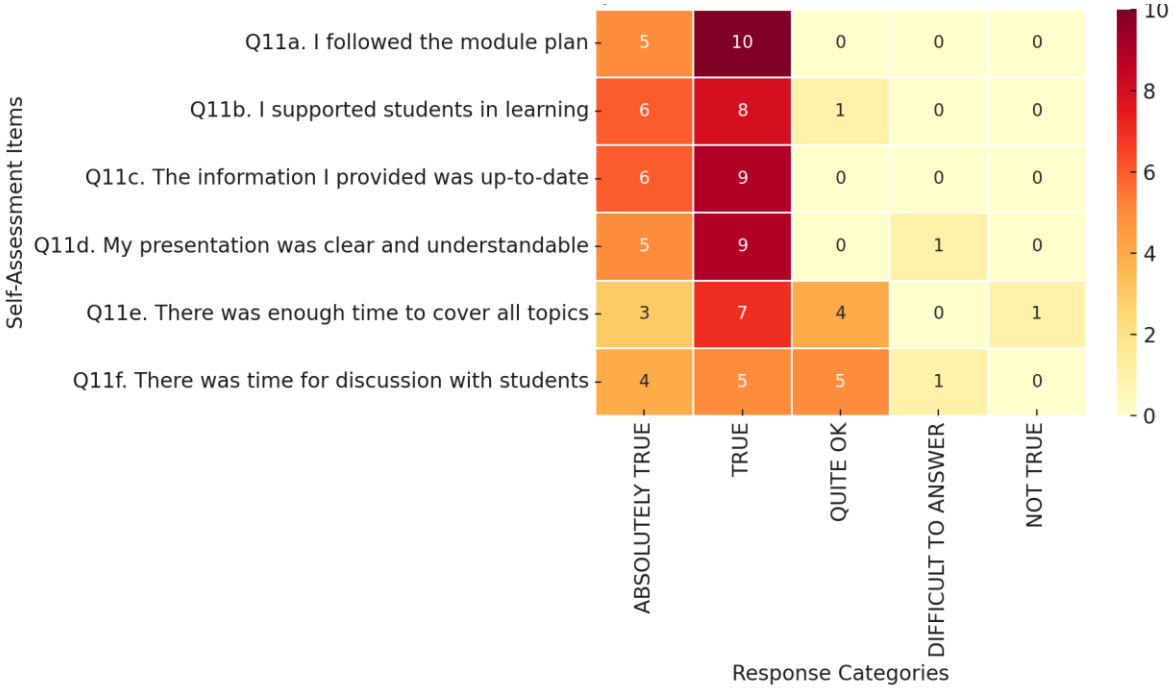


Figure 17. Summary of instructors' self-assessment

The results show a strong concentration of positive evaluations. For Q11a, 5 instructors (33%) selected "Absolutely True" and 10 (67%) chose "True," indicating unanimous agreement that the module plan was followed. Similarly, in Q11b, 6 respondents (40%) marked "Absolutely True," 8 (53%) selected "True," and 1 (7%) chose "Quite OK," suggesting high confidence in the instructors' ability to support student learning. In Q11c, 6 instructors (40%) rated the information as "Absolutely True" in terms of being up-to-date, and 9 (60%) as "True," confirming broad agreement on content relevance. In Q11d, which focused on clarity and comprehensibility of presentation, 5 instructors (33%) answered "Absolutely True," 9 (60%) "True," and 1 (7%) "Difficult to Answer," indicating generally positive but slightly less uniform feedback. In contrast, responses to Q11e and Q11f were more dispersed. For

Q11e, 3 instructors (20%) selected “Absolutely True,” 7 (47%) “True,” 4 (27%) “Quite OK,” and 1 (6%) “Not True,” suggesting that time allocated to cover all topics was sometimes perceived as insufficient. Similarly, in Q11f, 4 instructors (27%) answered “Absolutely True,” 5 (33%) “True,” 5 (33%) “Quite OK,” and 1 (7%) “Difficult to Answer,” reflecting a broader range of experiences regarding the opportunity for discussion with students. In sum, the self-assessment results indicate that instructors perceived their teaching performance during the module in largely positive terms. They expressed particular confidence in their adherence to the course plan, support of student learning, and delivery of current and clearly presented information. The relatively varied responses on time-related aspects point to potential areas for improvement in scheduling or workload planning. These insights provide valuable input for further refinement of instructional practices and program structure.

The final question invited open-ended feedback and suggestions. Instructors were asked: *“What do you consider to be the main strengths of the study program? What areas do you believe need improvement?”*

Strengths

One of the most frequently mentioned strengths is the **integration of practical examples into the curriculum**. Instructors emphasized that subjects are well connected to real-life applications, which supports student engagement and enhances learning outcomes. This practical orientation was viewed as essential, particularly in the context of construction and renewable energy-related modules.

Another recurring theme is the **adequate level of students’ prior knowledge**, especially among those with technical backgrounds such as construction students. This foundational competence was seen as a facilitating factor for more advanced instruction. In addition, specific elements such as **drafting** and the **life cycle perspective of buildings** were singled out as positive components of the program.

Areas for Improvement

While generally favorable, some comments suggested the need for **modernization of certain subjects.** One respondent noted that the treatment of topics such as the life cycle of buildings appeared more traditional than progressive, implying a need to incorporate more contemporary approaches or updated content. The feedback also hints at opportunities for **strengthening interdisciplinary integration**, especially between sustainability concepts and technical education.

Lexical Patterns and Emphasis

The most common keywords extracted from the responses include “students,” “subjects,” “practical,” “connections,” and “creation.” These reflect a focus on applied learning, curriculum relevance, and the constructive linking of theoretical content with professional contexts.

Overall, instructors view the program as strong in terms of relevance and practical orientation, with student preparedness seen as a supportive asset. Suggestions for improvement center on updating content and enhancing interdisciplinary coherence. The open-ended responses thus offer a well-rounded perspective that affirms many existing strengths while providing constructive input for future development.

Summary

The evaluation of the *Management of Renewable Building Energy Technology* program indicates a high level of student and instructor satisfaction, particularly regarding teaching quality, learning atmosphere, and the practical relevance of course content. Students valued the expertise and supportiveness of instructors, as well as the program's clear structure and alignment with career goals. The collaborative learning environment and hands-on activities were frequently cited as key strengths. Despite these positives, several areas require attention. Both students and faculty noted time constraints during sessions, which limited discussion and full coverage of content. Access to supplementary materials—such as readings and digital resources—was also seen as insufficient. Library services, while functional, were rated as only average by many students, and assessment methods could benefit from greater clarity and fairness, especially in group tasks. To strengthen the program, the following **recommendations** are proposed:

– Adjust scheduling to allow more time for in-depth learning and interaction;
– Expand access to supplementary digital materials and updated library resources;
– Clarify assessment criteria and improve transparency in group work evaluation;
– Modernize selected curriculum elements, especially on sustainability and life-cycle analysis;
– Enhance interdisciplinary links between technical and environmental aspects.

These targeted improvements could help elevate the program from solid to excellent and ensure it meets the evolving needs of future learners.

Prospects for future uses

Germany

The Hamburg University of Applied Sciences (PP7 BHH) already has extensive experience in running dual bachelor's degree programmes in general and specifically in collaboration with SMEs. However, the courses offered to date have focused exclusively on business administration and management issues. The University of Applied Sciences is very interested in offering dual technical courses in the future and

therefore intends to implement the ‘Engineering in Management of Renewable Energy Technology in Buildings’ course developed in the BA&VET project. The Hamburg vocational schools for the relevant professions have already agreed to participate as partners. On 12 December 2025, the Hamburg Chamber of Crafts also made a binding declaration that she would participate in the implementation of this degree programme and attract SMEs as partners. Preparations began and will continue intensively after the end of the project, so that implementation can begin in autumn 2026 at the earliest, but no later than 2027.

Poland

Further implementations are also planned in Poland. Individual modules of the new ‘Engineering in Management of Renewable Energy Technology in Buildings’ degree programme will continue to be integrated into existing degree programmes and offered. In order to be able to implement the planned permanent introduction of the entire degree programme, a lengthy process must be completed. Introducing a new study programme at a Polish university, even one with high academic status such as Gdańsk University of Technology (Gdańsk Tech), is a demanding and multi-stage process. It requires coordination between academic staff, internal university authorities, and national accreditation institutions. The process aims to ensure that every programme meets both national legal requirements and European quality standards.

Polish higher education operates under the Law on Higher Education and Science (2018). The act defines who can create new programmes and under what conditions. Universities holding a scientific category of A+, A or B+ in a relevant discipline have the right to create new programmes autonomously.

Gdańsk University of Technology meets these criteria in several disciplines, including Economics and Finance, Management and Quality Sciences, and Environmental and Energy Engineering. Therefore, it can introduce new programmes independently, such as ‘Engineering in Management of Renewable Energy Technology in Buildings’.

However, even with autonomy, the path from concept to launch is long and formalized.

International accreditation typically follows six stages. (1) Eligibility & scoping: the faculty maps standards (CEEMAN IQA or AACSB/EFMD) to the programme, appoints a steering team, and confirms readiness. (2) Gap analysis & action plan: a diagnostic against ESG-compatible criteria (mission, learning goals, assurance of learning, faculty qualifications, engagement, impact) yields a remediation plan with milestones. (3) Self-assessment report (SAR): a rigorous evidence pack covering governance, curriculum design, AoL processes, stakeholder engagement, research relevance, and continuous improvement. (4) Peer review visit: international reviewers validate evidence through

interviews with leadership, faculty, students, alumni, and employers; they test AoL loops and data integrity. (5) Decision & conditions: the board grants accreditation (often with improvement actions) or defers pending fixes. (6) Maintenance: annual reporting and mid-cycle reviews demonstrate ongoing improvement.

The Faculty of Energy intends to begin the further internal process and external accreditation of the new degree programme 'Engineering in Management of Renewable Energy Technology in Buildings' immediately after the end of the project.

Estonia

There have been no dual study programmes in Estonia to date. It is a major success of the BA&VET project that the University of Tartu, Pärnu College, based on the project experience, has launched a groundbreaking integrated vocational and applied higher education programme and started its implementation while the project is still running "Tourism and Hotel Management" in Estonia.

Pärnu College is also planning to implement the newly developed degree programme 'Engineering in Management of Renewable Energy Technology in Buildings' and has begun internal preparations and consultations with the Tallinn University of Technology (PP3 TUT). In addition, the new programme offers Tallinn University of Technology the following opportunities for developing curricula and modules.

- Relevance to existing programs:
  TUT 5-year integrated study programme "Structural Engineering and Construction Management" gives the graduate a Master's Degree (MSc; 300 ECTS) and an initial qualification of Diploma engineer of buildings and structures, which equals level 7 at (out of 8) at the European Qualification Framework (EQF level 7).
  The new curriculum, which was developed by Satakunta University in Finland (PP2 SAMK) and tested in practice in Estonia, aligns well with the current Structural Engineering and Construction Management programme. The tested content can directly enrich and modernize existing courses focused on energy efficiency and green construction.
- Integration of individual modules:
  Selected modules (E.g., Basics of Energy, Environmental and Process Technology; Energy Efficiency in buildings and structures and Carbon-neutral and sustainable societies) could be incorporated as elective subjects.
- Interdisciplinary potential:

The program's focus on combining engineering, environmental sciences, and management supports interdisciplinary teaching and collaboration across departments.

- Practical orientation:
  The project-based and applied learning approach offers new ways to integrate real-life case studies and industry cooperation into the curriculum.
  The strong applied focus and project-based learning approach of the program could enhance students' practical skills and align with the university's goal of fostering innovation in sustainable construction.
- International collaboration:
  Testing the program creates a foundation for joint courses, student mobility, and shared digital learning environments with Satakunta University of Applied Sciences. Future cooperation could include joint supervision of theses, exchange of lecturers, and shared research projects in renewable energy and construction.
  It supports the development of joint projects involving students from technical and economic disciplines
- Long-term potential:
  The tested content provides a ready-made framework for designing an English-taught program, supporting the university's internationalization goals.
- It also offers opportunities for continuing education and professional development courses for industry professionals.

Finland

Satakunta University of Applied Sciences is a higher education institute and belongs to the third stage in the Finnish educational hierarchy. This means, that students applying the universities of applied sciences must have graduated secondary level, i.e., either passed the matriculation exam or graduated the vocational education institute. Universities of applied sciences do not give vocational education and training (VET).

Although universities of applied sciences (UAS) are much more independent, each UAS has an obligation to ensure that their curricula are completing the requirements of bachelor's degree or master's degree. This means that each UAS has a process of their own according to which curricula are designed and approved. In common, this process may take from six to twelve months. The implementation and quality of curricula is controlled by collecting feedback from students.

In Finland, it is not possible to implement dual study programmes. The concepts and curricula developed in the project "Engineering in Management of Renewable Energy

Technology in Buildings" will be used here in future as ‘normal’ bachelor's degree programmes. To this end, additions will be made to certain subjects (e.g. physics, chemistry, mathematics) in order to comply with Finnish requirements for bachelor's examinations. In addition, modules from the project's degree programmes will be incorporated into existing degree programmes at Satakunta University (PP2 SAMK). SAMK collaborates with both vocational education institutions and companies and other organizations too, thus, the results gained and curricula developed can be disseminated to VET institutions, enterprises, and organizations in Finland.

Other countries

From 2024 to 2028, Centres of Vocational Excellence (COVE) will be established in Germany, Denmark, Poland, Lithuania, Finland, the Netherlands, Hungary and Ukraine, which will be jointly operated by universities, vocational schools, chambers and associations. These centres have already decided to use and implement the study programmes developed in the BA&VET project.