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Creating an efficient Training package for corporate environment with battery energy Storages

Battery energy storages and corporate training

Tekniikan ja
innovaatiojohtamisen
akateeminen yksikkö
Automaatio- ja tietotekniikka
kandidaatin tutkielma

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TIIVISTELMÄ:
Tämän kandidaatintutkielman aiheena on yritysympäristössä tapahtuva koulutus akkuenergiavarastojärjestelmien alalla. Tutkielma on tehty Hitachi Energyn toimeksiannosta, ja sen tavoitteena on laatia koulutuskokonaisuus yrityksen sisäiseen käyttöön.

Tämän tutkielman tarkoituksena on luoda tehokas ja rakenteellinen koulutuskokonaisuus, joka vastaa yrityksen ja sen yhteistyökumppaneiden tarpeita ja mahdollistaa asiantuntijuuden jatkuvan kehittämisen teknologian kehittyessä.

Tutkimusmenetelminä on käytetty kirjallisuuskatsausta, haastatteluja sekä organisaation sisäisen koulutusmateriaalin analyysia. Tutkimuksessa tehdyt keskeiset havainnot ovat: materiaalin selkeä rakenne ja päivitettävyys ovat tärkeitä.

Eri oppimismenetelmillä on vaikutusta koulutuksen tehokkuuteen. Itseopiskelun tueksi suositellaan käytettäväksi yhteisöllistä oppimista ja ongelmalähtöistä oppimista. Eri oppimistyylien huomioiminen voi vaikuttaa oppimistavoitteiden saavuttamiseen, vaikka tutkimustulokset oppimistyylien ja oppimistulosten välisestä yhteydestä ovat ristiriitaisia.

Tutkielman johtopäätöksenä on, että koulutuskokonaisuuden rakenteen tulisi olla modulaarinen ja helposti päivitettävä. Koulutuksen tehostamiseksi suositellaan käytettäväksi esimerkkiasiakastapauksia ja ryhmäkeskusteluja. Koulutuksen vaikuttavuutta tulisi mitata puolivuosittain järjestettävillä arviointitesteillä.

KEYWORDS: Corporate environment training, battery energy storage systems, learning method comparison

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1 Introduction

The increasing use of renewable energy shows clearly in the global energy production capacity of renewable sources. According to Kurbatova and Pereder (2020) the production capacity of renewable sources at the end of 2018 was 1.45 TW, which is double the amount in 2013. This growth demonstrates that renewable sources are integrated more into the structure of energy production, which emphasizes their increasing role in filling the demand of energy production.

Renewable energy sources, such as solar and wind power, are inherently variable in their production capacity. Coppitters and Contino (2023, p. 1) highlight that renewable energy supply is intermittent, making it subject to fluctuations in availability. This intermittency creates challenges for energy systems, necessitating the use of battery energy storage technologies to balance supply and demand effectively.

Battery energy storage technologies have developed significantly during the past decades and the applications have widened to high power electrical grids and short-term storage solutions of industrial and technological needs. Smith et al. (2008, p.1) emphasize that the size, capacity and design complexity have improved significantly, and the technology is expected to keep improving due to the reason that energy storage systems are a key part of making renewable energy more reliable.

New innovations and technologies being made rapidly and it is obvious that it is necessary that people working on the battery energy storage systems must update their knowledge on the technology frequently.

Mustafa and Lleshi state (2024, p.1) that continuous learning and improvement of employees are in key role of the success of corporations. Only formal training is not enough. Practical skills and continuous learning are important factors in working efficiency and improving the services of a business.

This is why it is strategically important to train the employees constantly. This puts pressure on companies to develop training methods which meet not just the current needs and also can adapt to changes in the future.

Hitachi Energy (2025) is a global leader in power and grid technologies, offering products, services and consulting for a clean and secure energy future.
Hitachi Energy also deploys battery energy storage systems (BESS) designed for the flexible management of multiple distributed energy resources – both grid-connected and off-grid microgrids. With in-built grid forming technology it enhances the resilience and reliability of storage systems by providing the necessary control and coordination. Thus, ultimately ensuring reliable power, seamless renewable integration, and grid stability.

Employees are trained internally using training materials developed by the company. It was necessary to compile the training materials into a clear and structured package and divide them into basic and advanced levels. Another goal was to create guidelines for future updates to these training materials as technology advances. This bachelor's thesis explores how to compile a training package from Hitachi Energy’s training materials within the specified framework.

As a research method literature review and expert interviews are utilized. Training materials from Hitachi Energy are independently reviewed. On top of this, knowledge is deepened by researching academic sources found online. To correctly apply knowledge from academic sources and Hitachi Energy training materials conversations will be held with Hitachi Energy, which will be in support to understand the core principles, needs and challenges of the area. This is how a comprehensive perspective will be constructed for the training package.

In the following chapters, the background of the research and the current state of the training materials will be addressed. The research methods and analysis will follow. Finally, conclusions and recommendations are presented.

Research questions in this thesis are:

1. How can a training package be compiled from pre-existing materials to ensure efficiency and ease of updating?
2. How should this package be maintained in the future?
3. How do learning methods impact learning performance?

2 Development of the training material structure

2.1 Goals of the training package

The training package's target audience has different roles with different needs. The package contains multiple documents that are specific for certain roles. The number of documents also makes it difficult to navigate the content without clear structure.

For the training package to serve as an effective tool for the company it must have clearly defined goals. The main goals set for the package are speeding up the process of training material navigation, providing needed information for the certain role and making training more efficient.

2.2 Process of organizing training materials

According to (Elnaga, 2013) in the design of training programs it is important to ensure that the material is easily updatable and can handle the changing needs of the organization. The training materials should not only improve the current skills of the employees. They should also prepare them for future challenges. This work follows these principles by organizing the training materials into a clear structure, that has pre-defined areas of responsibility to update the content. This way ensures the package is up to date and effective.

According to a senior sales specialist from Hitachi Energy (Emad Al Hamrani, personal communication, 23.12.2024) this training package is meant for its new and existing employees. The training package structure must consider the lack of previous knowledge and advancements in technology.

2.3 Analysis of content

The content of the documents and presentations was thoroughly analyzed to identify their subject matter, purpose, and relevance.

Materials were organized into a folder structure with four main categories: Overview and Introduction, Fundamentals and Technical Knowledge, Business Process, and Customer Focus and Service.

Each main category was further divided into two levels: Basic and Advance. The Basic level is intended for all employees to provide a foundational understanding, while the advance level is tailored for individuals specializing in the respective field within the company. For example, the advanced content under Business Process contains critical information specifically aimed at project managers and tendering professionals.

The ability to take in the educational material is dependent on the learners' individual learning abilities. Sawang, Newton and Jamieson (2013, p. 85) observed in their study that technological confidence and openness to change are core factors in making e-learning successful. This supports the idea that the training package structure should be divided to different levels in which different roles and learning levels can utilize it effectively.

2.4 Categorization and folder structure

To create a folder structure that effectively serves the unique roles within the company, it was necessary to first identify the key target audience of this training package.

According to an senior sales specialist from Hitachi Energy (Emad Al Hamrani, personal communication, 23.12.2024) there are key roles in the company that need only certain bits of the whole package. The key roles identified were: Business developer, Sales, Tendering, Project Management, Engineering, Commissioning, and Service Engineers.

Each role has distinct training needs and levels of expertise required, which were carefully considered when designing the folder structure. For example:

- *Sales require a broad understanding of products and services to effectively engage clients.*
- *Tendering professionals need detailed insights into pricing and technical specifications to develop competitive proposals.*
- *Project Management focuses on workflows, resources, and strategic planning.*
- *Engineering and Commissioning teams require technical depth to execute and optimize energy solutions.*
- *Service Engineers need access to maintenance procedures and resources.*

This role-specific approach's end goal was that the folder structure is intuitive and that employees can easily find the materials most relevant to their responsibilities.

3 Training Design concepts

3.1 Structure

Curriculum of professionals must be clearly structured and support learning in various methods. Druzhinina et al. (2018, p 1) present five key principles, that guide the development of an effective curriculum.

1. The content must be relevant and linked to real problems.
2. The materials and tasks should be structurally aligned.
3. Learning requires higher levels of cognitive processes.
4. All parts of the curriculum must be aligned with the goals of learning.
5. The learning materials must provide challenges, motivation and interest to the students.

The same article also contains real life experimental findings. The most important findings were: Modular curriculum enhanced student motivation. Online based and remote learning added to the level of satisfaction and enables personal learning paths. Regular evaluation of the curricula betters the quality and supports continuous learning.

According to research, authentic training tasks increase the learner satisfaction greatly and the use of the learning materials. Sawang et al. (2013, p 92) proved that real life work involved learning tasks increased learners' motivation and the rate at which they used the materials. This means that the training materials should include practical examples. In the context of Hitachi Energy this can be achieved by presenting examples of real projects.

High level cognitive thinking involves solving complicated problems, critical evaluation of information, and creating new information. It is based on both general cognitive skills such as reasoning, problem solving and metacognitive skills that include self-reflection, control of learning strategies and control of one's own thinking processes. According to research experts can pick out meaningful patterns from data, organize information based on higher-order thinking and search for important information more efficiently than

beginners. With high-level thinking skills learners can transfer their expertise to a new context which is fundamental in learning and in being an expert (Billing, 2005, p.1-18).

3.2 Different learning needs

The capacity of working memory on an individual is linked to how individuals process and comprehend new information. Low working memory is often linked to difficulties keeping in mind large amounts of information at once. This can cause difficulties with text-based learning and complicated thinking processes. Graf, Lin and Kinshuk (2008) observed in their research that low working memory individuals benefit the most out of visual and global learning style.

In visual learning it is essential to use images, graphs, and other visual elements to present information. This reduces the load on working memory, the learner can more quickly comprehend information and keep it in mind. Global learning means that learners understand a concept better if it is represented as wider concepts opposed to a series of separate facts. This helps especially when the working memory is incapable of handling several details at once.

The material in the training package can be designed in the future to take into consideration low-working memory learners. This can be done by adding as much visual aids and structuring the package into large concepts. Also complicated information can be broken down into smaller sections and be presented one by one. This is done to make it easier to comprehend it.

Masela and Subekti (2021) declare that correlation between learning styles and learning results have not been explicitly found. Research results in different contexts have been conflicting. This research showed results where the link to auditory and kinetic learning styles to learning a second language was weak or statistically meaningless. This research is good evidence that there is no need to have individual learning styles as the main point

of creating a learning environment. Taking individual learning styles into consideration did not have satisfactory reasoning in which learning styles can be ignored.

With the information presented it is rational to organize the training material into a neat structure that divides the material into categories of relevant information. This makes the package more comprehendible, and the content is easier to target to certain groups. The training package was divided into two levels of training: basic level and advanced level. This was done to ease load on an individual employee and not have unnecessary information be part of mandatory training. This is supported by the key principle of curriculums that states all information should be relevant to the learner.

Basic level is meant for all employees. It is fundamental concepts that are seen as necessary information no matter the respective role in the company and especially for new employees with no background in the company or field. In the folder Introduction and fundamentals all information is put to the basic level as there is no advanced level of fundamentals.

3.2.1 Basic level

Overview and introduction on the basic level contains information about the company products, services and workflow. Technical knowledge and fundamentals contain information about the overall structure of battery energy storage systems and their role in supporting renewable energy. Business process contains information about project management and other processes of business.

The goal is to give all employees a common understanding, in which they grasp the company strategy and business model. It also prepares them to work efficiently in different departments.

3.2.2 Advanced level

The advanced level of the training package is meant to be a deep dive of different knowledge. It is information that is necessary only for specific roles and not for all employees. This divide is meant to ease the load on an individual employee, in which they do not have to comprehend as much new information all at once. Each advanced level folder serves certain roles and responsibilities.

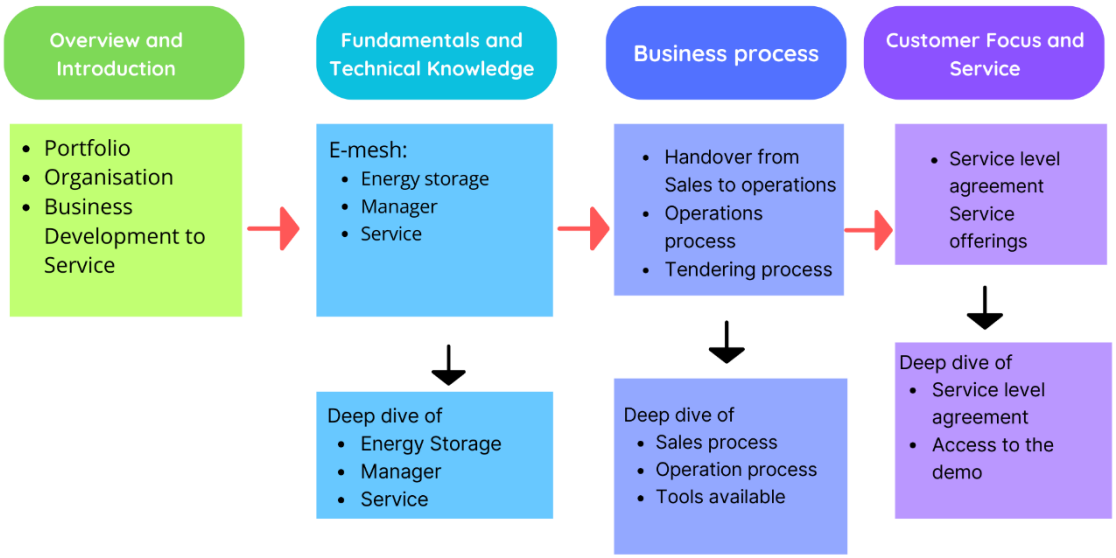

Figure 1 Training Overview

Figure 1 Training Overview is a process flow chart that is meant to represent how a learner is supposed to follow the training material and dive to the advanced level if their own respective role requires the deep dive.

3.3 How training should occur

Learning is most effective when it occurs in a social setting where learners can interact with one another and share information from different points of view. According to Billing (2007) social learning enhances the comprehension of information and helps learners develop critical thinking for the reason that they demand participants to have common conversations where one needs to reason their own viewpoints and evaluate others' thoughts. Co-operative learning also supports metacognitive skills. This occurs when learners have to reflect what they have learned in relation to the group's views and solve problems together.

Varied learning tasks are another core feature that helps the transfer of learning. When information is applied in different contexts, participants learn to recognize patterns among different situations and utilize what they have learned in different contexts. Billing (2007) says that the teaching should include varied examples and tasks that challenge the learners to apply what they have learned in different contexts.
This will help them to develop more abstract schemes of thinking that are not left tied to a specific learning environment.

For the efficiency of learning it is essential that the training is not based only on individual work, it also includes interaction and varier learning tasks. Social learning and varied learning tasks provide the learner the chance to develop deeper understanding and enhance applying the information in practical work.

With this information presented one can conclude that when Hitachi Energy uses the training package to train the new/existing employees and business partners it should make sure that it happens in a group setting where participants have the chance to have conversations with other participants about the content. The training situation should also include simulative situations where the learning participants should try to figure out solutions based on what they have learned.

3.4 Creating training for different regions

Hitachi Energy does business across the globe and due to these interactions among cultures routinely happen. Hitachi Energy employes people from multiple cultures. For this reason, it is rational to take into consideration how the training package should be fitted to different kinds of cultural contexts to suit the employees that are trained.

Lenartowicz, Johnson and Konopaske (2014) declare that there exist two kinds of information about cultures. There is explicit information that can be expressed easily in language and can be easily defined. There is also silent information that is more difficult to express in language and is learned through experiences, later reviewing those experiences and then having more new experiences.

Lenartowicz, Johnson and Konopaske (2014) emphasize that cultural learning is a continuous process that is impossible to be done in a single learning session and instead it happens gradually through experiences, reflection and interaction. This means that taking into account cultural differences among global branches is not a one-time project, it is instead a longer continuous task.

Bennett, Aston and Colquhoun (2000) emphasize that the biggest reason for failures in international commissions is not the difficulty of adjusting to the local cultural environment, it is instead weak relationships with local workforce and partners. These authors make the point that not all cultural training programs are made equal. The programs that perform the worst focused too much on cultural adjustment instead without taking into consideration how the local working environment affects the worker.

With this information presented it is rational to draw the conclusion that when creating cross cultural teams and co-operation at Hitachi Energy it is important to create human networks that support individuals working in global jobs. This would increase the chance of successful corporate collaboration happening. Creating these networks could happen

by making the training sessions involve group work with new employees across different countries where Hitachi Energy has an existing workforce.

3.5 Future needs

The training package should be easily updatable due to rapid development in battery energy storage technologies. According to Whittingham (2012, p.1518) energy storage advancement, such as lithium ion batteries and alternative storage systems' development will experience great changes in the incoming decades. These innovations are needed especially to integrate renewable energy and ensure stability in the electrical grid with regards to upcoming regulations. With the technology developing constant updating of the materials is necessary, in which that employees always have up to date information and skills to respond new challenges and opportunities in the field.

Updating happens by assigning individual's or roles in department leads to making these updates. They are responsible for updating their own respective area of expertise in this training package.

At the moment the training package does not yet require high-level cognitive thinking which was stated as crucial piece of learning environments. In order to create environments that demand high level-cognition it would be useful for the learners of this training package to receive some kind of tasks that require reading, evaluating information, and writing. For instance, there could be technical solutions or sales strategies for the battery energy storage systems that are designed to be flawed if executed in real life. The learners should pick out these flawed strategies and solutions with the information given to them. After this they should propose a new strategy that addresses this.

The need for testing the learned materials could also involve simulative scenarios where a preprogrammed simulation generates a set of customer needs and challenges. The

program has a set of variables that are customers' needs. These include the customer's technical capabilities and limitations, price, country where they operate.

4 Maintaining and updating the training package

4.1 Maintaining and updating the training package

Maintaining the package of training materials is a continuous process and it can face challenges that might put to risk content, integrity and efficiency. Here are common pitfalls, which should be avoided when making updates.

Flawed version control: If updates are not documented or version control is not used, old and added information can mix. This can lead to employees using outdated or conflicting materials.

Overloading with new content: Adding too many details or excessive technical information, the understandability of the training decreases. The cohesion and accessibility of the information must be maintained. When updating the package with new materials it is important to avoid excessive info and complicated presenting methods. Sawang et al (2013, p. 99) observed that too complicated e-learning methods reduce the usage of training if the organization does not provide support for using it. For this reason, the structure should remain clear, and updates should be managed in a manner that the outdated or unnecessary information is deleted actively.

Disregarding the needs of distinct roles: when making updates it may be forgotten that the material should serve specific roles. All materials are not relevant to all employees and the content can become too generic.

Maintaining outdated material: Outdated content might be missed by accident even though it might not be relevant anymore, this can lead to confusion and conflicting directions.

4.2 How to measure the effectiveness of the package

Measuring the success of corporate context training requires a clear measuring strategy, which matches the business goals of the company. The measuring strategy can be divided into three main models: compliance based, value based, or an combination of both. The compliance-based strategy focuses on filling the legal requirements of the training and the value-based strategy focuses on the effect that the training has on employee professional skills and the results on business goals (Barnerr & Mattox, 2010, p.2-10). For the measuring strategy to be effective it needs to define which training programs are measured in detail and which programs are measured with lighter methods such as feedback from the participants or with test results.

It is important to focus resources to the training programs which results are expected to have greater effect. Measuring the effectiveness of all the training can be too resource demanding and time consuming (Barnett & Mattox, 2010, p.17). This way of measuring makes it possible to improve the quality of the training and helps companies make informed decisions for their investments in training.

Method used for determining the effectiveness of the training according to a Vice president of Hitachi Energy Finland (Kärki, 2025) there is a quiz to finalize the training course and also an evaluation survey is sent out to employees. The results are analyzed and the most common points that had wrong answers are reviewed, also the training is enhanced.

At the moment it measures the ability of the trained individual to memorize pieces of information to short-term memory. This method does not define much about the long-term effects of the participant. In the actual job it is important that the information taught is remembered on long term.

This method could be improved upon by simply giving the same quiz to the employees again after 3-6 months after the first training. This would reveal what parts of the training are forgotten after the first memorization.

The second attempt at the quiz could have some review questions for the improvement of the training. Employees taking the quiz could tell whether they felt that the information in the training corresponded with actual work or not. Also, the quality of work or safety in the company could be evaluated and if the training had significant effect on them.

Supervisors and more experienced employees could also participate in the evaluation of the training by judging whether they have observed any significant effects on the performance or expertise on their co-workers. There could be an open feedback possibility for improving some specific part of the training or adding something that is missing.

With these assessments the long-term effectiveness of the training can be better measured, ensuring that the content remains impactful and relevant to the workplace.

4.3 SWOT analysis of the package

The goal of this analysis is to evaluate the strengths, weaknesses, opportunities and threats of this package. SWOT analysis helps recognize which sub parts work well, what has room of improvement and what kind of opportunities to of development the training has and what outside factors might prove to be road blocks. Making future development decisions on the training can be made better informed with the SWOT-analysis results in mind.

Strengths

The package has clear structure where to add in new documents when that needs to be done. The package has a concrete plan on how it needs to be updated in the future.

Every subsection of the package gets an assigned person that is responsible for updating it with new information. This is a strength that outdated information is not simply waiting for somebody to notice it and possibly spread misinformation to new employees. The package has a real plan on how it is kept up to date.

Weaknesses

The package at the moment does not have an internal way to assess the competence of the learner. This means that when training is done, the learner cannot test themselves in any meaningful way yet.

Opportunities

The training package at the moment can serve as a good basis as a learning material structure. The package can serve it's purpose well on as it is and adding to it is easy. This means that adding interactivity or new material is quick and easy.

This learning package also has the opportunity of working as a template for future training packages. Even more specialized and in-depth training packages might be developed in the future. With this training package already done the development of the future training packages can be more efficient and quicker as this training package can provide useful insight into how a training package can perform in real training scenarios.

Threats

This package has bits of information that needs to be updated frequently. Technological capabilities change, business strategies change, price changes. The threat this package might face is simply neglect by people that should be responsible for the content.

Due to the wide range of content the package has it needs to be revised by many different experts within the company often. Due to the necessity of having multiple individuals working on it, there is an increased chance that one individual might neglect their respective subsection.

4.4 Employee feedback on the package

A test round of training was done 5.3.2025 to get feedback on how the training material performs in real life. Due to time limitation only the overview portfolio was covered which gave a broad understanding of the offerings.The audience were Hitachi Energy employees who were already familiar with the content.

Most important feedback that was given was that the example presentation used was found the training content lacked engagement and clarity, making it difficult for participants to follow and retain the information. Animations and more colorful graphics were suggested to combat this.

4.5 Future development of the package

In the case that Hitachi Energy wants to improve the package effectiveness in the future as a better suited learning experience for the company's needs it is essential that research into different possible directions of development is done. Down below is presented a matrix of learning methods. The presented learning methods could be applied for teaching this package if further development is seen as necessary.

4.5.1 Self-directed learning

SDL (self-directed learning) is a process in which a learner is responsible for designing, executing and evaluating their own learning. Dynan, Cate and Rhee (2008) define SDL referencing Knowles(1975): *"Self-directed learning (SDL) is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.*" This definition emphasizes the individual responsibility in their learning process and shows that SDL can happen independently and with external help.

4.5.2 Collaborative learning

Francescato et al. (2006) describe collaborative learning as a process, in which learners build information together through social interaction and utilize the group's members' points of view for critical thinking and developing problem solutions.

The article defines collaborative learning as a social process where learners work together to achieve common learning goals. This helps develop critical thinking, reflection and information building with others. It is based on the idea that learning is not only individual receiving of information, it is also common information sharing and creating new points of view. In order for collaborative learning to work, learners must actively interact and participate, in which that learners can utilize other's points of view and build new information together.

Brindley, Blaschke and Walti (2009) describe collaborative learning as a process where building information through social is a critical element and learners develop problem solutions together. Learners not only receive information, they also process and share it actively. This article concurs that collaborative learning is the most useful when learners utilize each other's points of view and information to understand new concepts. This improves the participants' critical thinking, reflection and problem-solving skills.

4.5.3 Problem based learning

Newman (2015) describes problem-based learning (PBL) as a method of learning where the learning process occurs around real or authentic problems and learners learn to gather, analyze and apply information through independent work and through group work.

The basis of PBL is to solve open ended problems which are in nature possible to interpret in multiple ways and which reflect real world problems. Learning is an

integrated process that combines cognitive, metacognitive and professional development.

Teacher's role is no longer a sharer of information, instead a facilitator that helps learners find answers independently. Learners work in groups and each individual is responsible for reaching their personal learning goals. Building information is based on previously known information and contextual learning which means that problems are tied to real world situations. PBL develops critical thinking and problems solving skills. Proving it's efficiency with traditional methods is challenging and results differ among fields of study.

As an example for the context of Hitachi Energy and battery energy storage systems an authentic problem that could be used for the PBL training could include an imaginary situation where a customer has specific technical needs. The customer might be a municipality or an industrial facility that seeks to invest in battery energy storage system in order to combat the variability of performance from wind and solar farms also participate in energy markets and ancillary services.

The engineering part of the battery energy storage solution could also involve some randomized variables that require creative thinking from the participants in the training. Such as not reliable performance of an electrical grid at the installation site. Collaborative learning could be encouraged by putting these creative problems for groups instead of individuals.

Table 1. Learning methods compared

Learning method	Interactivity and co-operation	Flexibility	Needed resources
Self-directed learning	Learning in mainly independent with possible small interaction.	Can provide significant flexibility for individual learner.	Requires at a minimum only the training material without a human teacher.
Collaborative learning	Interactivity and co-operation are essential. They are a key element of this method.	Can be flexible depending on the individual group. Working solely with other people can be an issue.	Requires less human resources as the learners partly teach each other. Might require more time.
Problem based learning	Both independent work and interaction with other learners is utilized.	Execution can be very flexible as the problems are developed individually for the learning package.	Takes less human resources than normal classroom teaching. Teacher must always be present.

4.5.4 Learning method development for the package

Based on information about different learning methods. It Is rational to conclude that Hitachi Energy should use in the future a combination of collaborative learning and problem-based learning.

The reason for this is that a corporate environment that develops battery energy storage solutions the real life work itself will require problem solving skills and high level of collaboration with other people. Engineering work and project management especially can be roles where it is crucial for the individual to have competent critical thinking capabilities and ability to analyze the work of other people.

Rapidly changing technical capabilities and business environment should also be taken into consideration and updated to the materials by regular checks half-yearly or quarterly.

5 Conclusion

This conclusion presents the findings from the research questions and the results from them.

1. How a training package can be compiled from pre-existing materials to ensure efficiency and ease of updating?

The organization of the training material was designed to improve accessibility, clarity, and efficiency in employee training. By structuring the content into modular sections, employees can more easily find relevant information according to their role and level of expertise. The division into Basic and Advanced levels ensures that all employees gain foundational knowledge while allowing specialized personnel to access deeper technical content.

Additionally, the structured approach facilitates updates and maintenance, ensuring that the material remains relevant as technology and business needs evolve. The reorganization also enhances learning efficiency by reducing cognitive overload, as employees can focus on the most relevant sections without unnecessary exposure to unrelated information.

The training package does not right now take into consideration interactivity and high-level cognitive thinking that were stated as key principles when designing curriculums.

3. How do learning methods impact learning performance?

High level cognitive thinking could be achieved through discussion sessions with other learners, targeted questions about the material simultaneously while it is being presented to the target audience. It is possible that these kinds of interactive sessions would take working hours from the employees, that is training the material to new employees. This would possibly make it more difficult to organize such interactive sessions.

The training package in the current form is self-learning materials that one is expected to go through by themselves. This might reduce the need for current employees to

participate in the training. This makes the possibility to get immediate feedback and guidance more difficult.

Using more learning methods such as problem-based or collaborative than just self-learning would also be recommended as it is according to research useful for the development of critical thinking and problem-solving capabilities.

The package also does not take into consideration how it challenges the learner or how the individual interests of learners could be made useful.

2. How should this package be maintained in the future?

In the future it is rational for the people responsible of employee training to seek solutions of training that require collaboration, problem solving based learning and high level of interaction with other learners as these methods seem to develop the skills that are necessary for the work that is done at Hitachi Energy.

6 References

Barnett, K. & Mattox, J. R. (2010). *Measuring success and ROI in corporate training*. Journal of Asynchronous Learning Networks, 14(2), p. 1–17. https://files.eric.ed.gov/fulltext/EJ909874.pdf

Bennett, R., Aston, A. & Colquhoun, T. (2000). Cross-cultural training: A critical step in ensuring the success of international assignments. *Human Resource Management, 39*(2–3), 239–250. https://doi.org/10.1002/1099-050X(200022/23)39:2/3<239::AID-HRM10>3.0.CO;2-D

Billing, D. (2005). Teaching for transfer of core/key skills in higher education: Cognitive skills. Studies in Higher Education, 30(3), 1–18.
Noudettu 10.2.2025 osoitteesta
https://link.springer.com/article/10.1007/s10734-005-5628-5

Brindley, J. E., Blaschke, L. M. & Walti, C. (2009). Creating effective collaborative learning groups in an online environment. International Review of Research in Open and Distributed Learning, 10(3), 1–18. https://doi.org/10.19173/irrodl.v10i3.675

Druzhinina, M., Belkova, N., Donchenko, E., Liu, F., & Morozova, O. (2018). Curriculum design in professional education: Theory and practice. *SHS Web of Conferences, 50*, 01046. Noudettu 21. tammikuuta 2025 osoitteesta
https://doi.org/10.1051/shsconf/20185001046

Coppitters, D., & Contino, F. (2023). Optimizing upside variability and antifragility in renewable energy system design. Scientific Reports, 13(9138). Noudettu 27. tammikuuta 2025 osoitteesta https://doi.org/10.1038/s41598-023-36379-8

Dynan, L., Cate, T. & Rhee, K. (2008). The impact of learning structure on students' readiness for self-directed learning. Journal of Education for Business, 84(2), 96–100. https://doi.org/10.3200/JOEB.84.2.96-100

Elnaga, A. & Imran, A. (2013). The Effect of Training on Employee Performance. *European Journal of Business and Management, 5*(4), 137–147. Noudettu 29. tammikuuta 2025 osoitteesta https://core.ac.uk/display/234624593

Francescato, D., Porcelli, R., Mebane, M., Cuddetta, M., Klobas, J. & Renzi, P. (2006). Evaluation of the efficacy of collaborative learning in face-to-face and computer-supported university contexts. Computers in Human Behavior, 22(2), 163–176. https://doi.org/10.1016/j.chb.2005.03.001

Graf, S., Lin, T. & Kinshuk. (2008). The relationship between learning styles and cognitive traits – Getting additional information for improving student modelling. *Computers in Human Behavior, 24*(2), 122–137. https://doi.org/10.1016/j.chb.2007.01.005

Hitachi Energy. (2025). Company profile: High voltage products. Noudettu 30. tammikuuta 2025 osoitteesta https://www.hitachienergy.com

HitachiEnergy. (2025). Homepage. Retrieved from www.hitachienergy.com

Kärki, D. (2025, February 05). Vice-President. (H. Seppä-Lassila, Interviewer)

Kurbatova, T., & Perederii, T. (2020). Global trends in renewable energy development. *2020 IEEE KhPI Week on Advanced Technology (KhPIWeek)*, 260–263. Noudettu 29. tammikuuta 2025 osoitteesta https://doi.org/10.1109/KhPIWeek51551.2020.9250077

Lenartowicz, T., Johnson, J. P. & Konopaske, R. (2014). The application of learning theories to improve cross-cultural training programs in MNCs. *The International Journal of Human Resource Management, 25*(12), 1720–1738. https://doi.org/10.1080/09585192.2013.860384

Masela, F. D. & Subekti, A. S. (2021). Auditory and kinaesthetic learning styles and L2 achievement: A correlational study. *Indonesian Journal of Applied Linguistics, 11*(2), 357–366. https://doi.org/10.17509/ijal.v11i2.7529

Mustafa, B., & Lleshi, S. (2024). The impact of lifelong learning and investments in employee development on employee productivity and performance. Multidisciplinary Reviews, 7, e2024175. https://doi.org/10.31893/multirev.2024175

Newman, M. (2015). Problem-Based Learning: An introduction and overview of the key features of the approach. Journal of Veterinary Medical Education, 42(2), 157–165. https://doi.org/10.3138/jvme.0315-036R

Sawang, S., Newton, C., & Jamieson, K. (2013). Increasing learners' satisfaction/intention to adopt more e-learning. *Education + Training, 55*(1), 83–105. https://doi.org/10.1108/00400911311295031

Smith, S. C., Sen, P. K., & Kroposki, B. (2008). Advancement of energy storage devices and applications in electrical power system. IEEE Power Engineering Society General Meeting. Noudettu 28. tammikuuta 2025 osoitteesta https://doi.org/10.1109/PES.2008.4596800

Whittingham, M. S. (2012). History, Evolution, and Future Status of Energy Storage. *Proceedings of the IEEE, 100*(May 13th), 1518–1534. Noudettu 26. tammikuuta 2025 osoitteesta https://doi.org/10.1109/JPROC.2012.2190170