POSITIVE LEARN

R3.1.1 Guideline for developing positive distance learning scenarios

POSITIVE LEARN

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EXECUTIVE SUMMARY

The present report is part of result R3 (Open Learning Scenarios and Exchange Platform (User Support Bundle)).

Developing positive distance learning scenarios is crucial in today's educational landscape, where distance learning is becoming increasingly common. This document sets out guidelines for designing effective distance learning scenarios, with a focus on mitigating technostress and ensuring a positive learning experience.

The instructional design process, as exemplified by the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), serves as the foundation for these guidelines. By following these guidelines, educators can create engaging and learner-centred distance learning scenarios that foster successful outcomes.

Key highlights of these guidelines include the following:

1. Introduction (Section 1): Provides an overview of the importance of positive distance learning scenarios in the current educational context and sets the stage for the subsequent sections.
2. The Instructional Design Process (Section 2): Introduces the ADDIE model as a comprehensive framework for instructional design. This model guides the entire process, from initial analysis to continuous improvement.
3. Designing Positive Distance Learning Scenarios (Section 3): This section delves into the heart of the guidelines, focusing on the following key aspects:

   Needs Analysis: Emphasises the significance of understanding learners' needs and challenges in a distance learning environment to inform scenario design.

   Definition of Learning Objectives: Demonstrates the importance of clear, measurable learning objectives as a foundation for effective scenario development.

   Instructional Design Theories: Discusses the application of instructional design theories to inform pedagogical choices.

   Instructional Methods: Explores various instructional methods and strategies for creating engaging and effective learning experiences.

   Technostress Management: Recognises the impact of technostress on learners and provides strategies for its mitigation, including risk analysis and the development of teacher competences.
4. Technostress Analysis Canvas (Section 4): Introduces a practical tool, the Technostress Analysis Canvas, to help educators assess and address technostress factors in distance learning scenarios.

5. Development of Positive Distance Learning Scenarios (Section 5): Concludes the guidelines by emphasising the practical implementation of the principles discussed, offering a step-by-step approach to designing and delivering positive distance learning scenarios.

In a rapidly evolving educational landscape, these guidelines are intended to serve as a reference for educators and instructional designers seeking to optimise the quality and effectiveness of distance learning scenarios while minimising technostress for learners and educators. By integrating these principles into their practices, education professionals can help ensure distance learning experiences are engaging, successful, and learner-centred.

1. INTRODUCTION

Learning Scenarios

The Greek National Learning Scenario Repository of the Greek Ministry of Education for Primary and Secondary Education "Photodentro" describes an **educational scenario** (**Learning Scenario** or LS) *"a learning framework with specific educational goals, expected learning outcomes, pedagogical principles and approaches, it utilises specific educational tools, and it is implemented through a series of educational activities, where students and teachers have well-defined roles".*

According to Megalou et al. (2022) a Learning Scenario is "the description of a learning context that focuses on one or more cognitive fields, sets explicit educational goals or expected learning outcomes, follows certain methodological approaches or pedagogical principles, and is implemented through a sequence of learning activities where students have well-defined roles, utilising specific educational tools". A learning scenario is an instantiation of an instructional design model for a specific topic and situation. It represents a structured plan that describes the educational process of a learning course and aims to guide teachers through this process. It defines the form and content of the teaching experience, i.e. learning outcomes, pedagogical theories, etc., and specifies the order of learning activities and learning material during a particular learning process. It therefore defines what learners, teachers and other actors should/can do with a particular set of resources and tools. Depending on the learning goals set, specific pedagogical methods are used, which in turn determine the sequence of activities, the appropriate resources, the role of the teacher etc. Kapaniaris (2020) notes that an educational scenario is "the complete teaching model, based on one or more theories of learning that in an organised structure frames the specific subject that will be taught along with the psychoeducational theories and teaching methodology that will be applied".

A **positive learning scenario** refers to a carefully designed and well-structured educational experience or situation in which the primary focus is on creating an environment that promotes effective and enjoyable learning

A **positive distance learning scenario** implies a virtual environment in which learners and teachers feel encouraged, empowered and motivated to actively participate and succeed in their distance learning journey, while minimising potential challenges and stressors associated with distance learning.

A **learning scenario template** is a structured framework or outline that instructional designers use to plan and organise the components of a learning experience. It serves as a guide to

ensure that all essential elements are taken into account when designing a lesson, course or educational activity. It helps ensure that the learning experience is well-planned, engaging and consistent with educational objectives. The specific format of a learning scenario template can vary depending on the educational context and the designer's preferences. Educators can customise and adapt the template to suit the specific needs of their learners and the learning objectives of the scenario.

Instructional guideline

An instructional guideline for a distance learning course provides recommendations and outlines principles for designing and delivering the course via ICT to promote effective learning. The purpose of learning scenario design guidelines is to provide a structured framework and set of best practices for educators and instructional designers to create effective and engaging educational experiences. These guidelines help ensure that learning scenarios are thoughtfully crafted to engage learners, meet specific educational objectives, and cater to diverse learning styles and needs. They help ensure that course content is organised in a logical and coherent manner, that learning objectives are clearly defined, and that teaching methods align with educational goals. By following these guidelines, course creators can enhance the learning experience, promote student engagement, and ultimately, facilitate more successful learning outcomes. Additionally, they serve as a valuable tool for consistency and quality assurance in educational institutions and online learning environments.

Typically, the Guideline includes recommendations for the definition of the course's **learning objectives**. Clear and measurable learning objectives should be set as a guide for the course design. These objectives establish what learners can or should know by the end of the course and serve as a basis for content development and assessment.

In addition, the Guideline should cover the topic of **instructional strategy** selection. Overall, effective instructional strategies suitable for eLearning must be applied. This could include a mix of multimedia elements, interactive activities, simulations, case studies, discussions etc. that engage learners and facilitate learning.

The Guidelines may provide instruction to ensure a logical and coherent **organisation of the course content.** This may include breaking the content into modules or units, arranging the topics in a meaningful order, and ensuring that there is a clear flow of information throughout the course.

Recommendations on the use of **multimedia elements and technology tools** can be included. This may include guidelines for including video, audio, images, animation, and interactive

elements to improve understanding and engagement. In addition, policies may describe the use of learning management systems, communication tools, and other technology platforms for course delivery and interaction.

The Guidelines may provide recommendations for the design of **assessments** to measure learner progress and understanding. This could include quizzes, questionnaires etc. Suggestions for providing

Recommendations may address the provision of **support for learners**. This could include the provision of **instructions,** guidance and constructive **feedback** to learners to support learning;, facilitating communication and interaction between learners and teachers; and offering resources such as additional reading or supporting materials.

The Guideline may emphasise the importance of Accessibility and Inclusivity, i.e. designing courses that are accessible to learners with diverse needs. This could include recommendations for ensuring compatibility with assistive technologies, providing subtitles or transcripts for multimedia content, and designing content that is inclusive and sensitive to cultural and diverse perspectives.

In particular, designing positive distance learning courses requires careful consideration of technostress **risks** to create an effective and supportive online learning environment. Overall, an instructional guideline for design for positive distance learning courses includes considerations and recommendations for the identification of potential technostressors and mitigation of relevant risks.

2. THE INSTRUCTIONAL DESIGN PROCESS

Meaningful learning occurs when the person seeking to learn is an active and engaged participant in the course. **Instructional design** is a systematic and iterative process of designing and developing effective and engaging instructional materials and learning experiences. This involves analysing the learning needs of the target group, defining clear learning objectives and creating teaching strategies and content in order to facilitate learning and achieve the desired results.

The aim of course design is to close the gap between the current level of knowledge or skills of the learners and the desired level of knowledge or skills. The design process includes a range of activities, including conducting needs assessments, designing instructional materials and activities, selecting appropriate instructional methods and technologies, and evaluating the effectiveness of instruction. During the instructional design process, considerations such as learner engagement, instructional strategies, and assessment methods are taken into account and the use of technology are integrated to create a learner-centred and effective learning experience.

The instructional design process starts with clearly defining the **learning objectives,** which drive the selection of appropriate **teaching strategies.** The chosen teaching strategies then inform the selection of specific **instructional methods** that align with the overall goals and objectives of the learning experience. **Learning objectives** are statements that describe what learners are expected to know, understand, or be able to do at the end of a learning experience. **Teaching strategies** refer to the overall approaches and techniques used by educators to facilitate learning. These strategies are broad in nature and guide the instructional design and delivery process. The choice of teaching strategy depends on the instructional goals, learner characteristics, and desired learning outcomes. **Instructional methods** are the specific techniques and practices employed within the chosen teaching strategy to deliver instruction and engage learners. These methods are more detailed and focused, representing the specific actions or steps taken by the instructor. Instructional methods are selected based on their alignment with the chosen teaching strategy and their effectiveness in achieving the desired learning objectives.

By carefully aligning learning objectives, teaching strategies, and instructional methods, instructional designers can create effective and engaging learning experiences that support learner achievement and desired learning outcomes.

2.1 The ADDIE model for instructional design

The **ADDIE** (Analysis, Design, Development, Implementation, and Evaluation) process is a widely used instructional design model used for the development of effective learning experiences (Molenda, 2003), including for the design and implementation of distance learning scenarios.

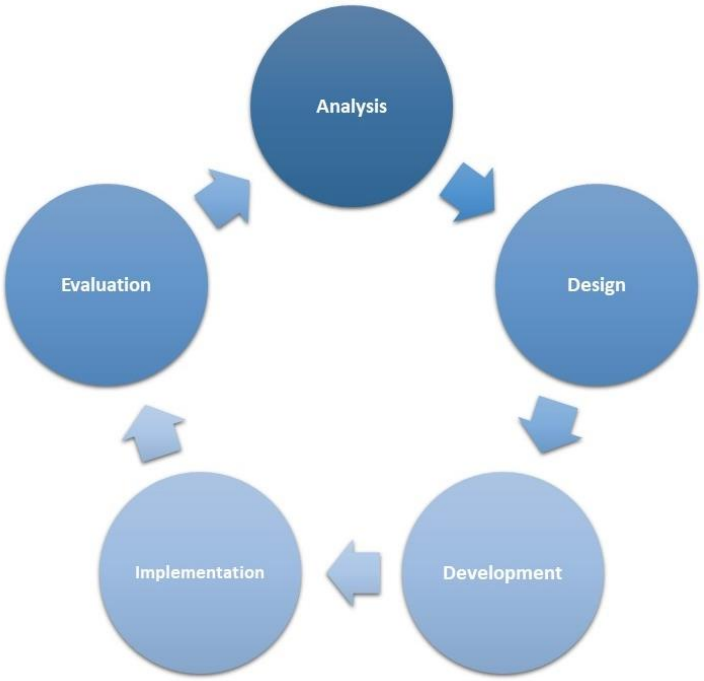

Figure 1: The ADDIE model for instructional design

Each phase of the ADDIE process plays a critical role in developing effective learning experiences:

Analysis phase

In the analysis phase, information is collected about the target group, their needs, existing knowledge and skills, and the learning objectives. This phase helps the instructional designer identify performance gaps and determine the scope and goals of the course to be developed.

Design phase

During the design phase, the instructional designer develops a blueprint for the learning experience. This includes the definition of the learning objectives, selecting appropriate

teaching strategies, determining the structure of content, and designing assessments and activities to support learning.

Development phase

During the development phase, all instructional materials are created based on the design specifications. This includes writing and organising the content, creating multimedia elements, developing assessments, and assembling the learning materials. The development phase focuses on turning the design plan into actual instructional materials.

Implementation phase

In the implementation phase, the developed learning materials are delivered to the target group. This can involve the teaching of different media such as face-to-face training.

Evaluation phase

The aim of the evaluation phase is to assess the effectiveness and efficiency of the instructional design. Assessment can take place at multiple levels, including learner feedback, performance appraisals, and overall achievement of learning objectives. Evaluation may include formative assessment during the development process to gather feedback and make improvements, and summative assessment to measure achievement of learning objectives and overall teaching impact.This phase helps identify areas for improvement and informs future iterations of the lesson design.

It's important to note that the ADDIE process is iterative, meaning that the results of the evaluation phase can inform revisions and refinements throughout the entire process. This iterative approach allows for continuous improvement and optimization of the instructional design.

3. DESIGNING POSITIVE DISTANCE LEARNING SCENARIOS

Figure 2: The ADDIE instructional design process

In this report, we focus on developing positive distance learning scenarios, looking at the first two phases of the ADDIE instructional design process: Analysis and Design. In the following sections, we will discuss several critical aspects of the process in detail: Needs analysis, Learning Objectives Definition, Instructional Design Theories and Instructional Methods, Technostress management.

3.1 Needs analysis: school education

School-age learners have distinct needs and characteristics that should be taken into account when designing instructional experiences. Here are some key considerations:

Developmental Stages: Piaget's theory of cognitive development (Piaget, 1972) states that humans progress through four developmental stages: the sensorimotor stage, preoperational stage, concrete operational stage, and formal operational stage. School-age children go through various developmental stages, such as concrete operational (ages 7-11) and formal operational thinking(ages 12 and up). Instructional materials and activities should align with these stages, offering age-appropriate content and cognitive challenges.

Attention Span: Scarpellini et al. (2021) study of distance learning in Italian primary and middle school children during the COVID-19 pandemic concluded that lessons were less organised and routines were more unstable for the youngest, who could not pay attention for more than

20 min (28.3%) and needed breaks every 10 min (21.6%), with lower quality of learning (40.6%), increased restlessness (69.1%), and aggressiveness (33.3%).Younger school-age children typically have shorter attention spans online, so instructional activities should be designed to be concise, engaging, and varied to maintain their focus. As they grow, attention spans tend to increase, allowing for more extended tasks.

Active Learning: School-age learners benefit from active learning experiences, described by Bonwell & Eison (1991) as learning in which students are actively or experientially engaged in the learning process, as opposed to passive listening. Depending on student participation, there are different levels of active learning. Also, there are a variety of alternatives for the term active learning and specific strategies, such as: learning through play, technology-based learning, activity-based learning, group work, project method, etc. Therefore, the inclusion of practical activities, group discussions and problem-solving tasks to promote engagement and a deeper understanding of concepts is encouraged.

Cognitive overload: Mayer's cognitive theory of multimedia learning makes three assumptions about how humans process information: the dual-channel assumption, the limited-capacity assumption, and the active-processing assumption (Mayer, 2009).The use of visual aids, graphics and multimedia is thus important to improve understanding, particularly for younger learners. Visual and audio elements can make content more engaging and memorable. However, a major challenge for instructional designers is avoiding cognitive overload in which the learner's intended cognitive processing exceeds the learner's available cognitive capacity. Therefore,multimedia instruction should be designed in wys that minimise any unnecessary cognitive load (Mayer & Moreno, 2003).

Interactivity: Kapp (2012) highlights the importance of promoting interactivity and engagement in learning through game-based methods and strategies for training and education. Kapp advocates the value of gamification in education, i.e. incorporating game elements such as challenges, rewards and competition into educational experiences to make learning more immersive and enjoyable. In this way, he argues that educators can harness the motivational power of games to enhance learning and improve retention.

Differentiated Instruction: Recognising that students have diverse learning styles and abilities.

Tomlinson (1995) described a person's learning profile as the ways in which they learn best as individuals. He claimed that learning-profile differentiation can help individual learners understand modes of learning that work best for them, and to offer those options so that each learner finds a good learning fit in the classroom. The goals of differentiated instruction is to accommodate individual needs and preferences by offering various materials, approaches, and assessments .

Support and Feedback: Hattie & Timperley (2007) stress the importance of feedback on learning and achievement. It refers to information provided by an agent (e.g., a teacher, a colleague, a book, a parent, a self, an experience) regarding aspects of one's performance or understanding. For example, a teacher or parent can provide corrective information, a colleague can offer an alternative strategy, a book can provide information to clarify ideas, a parent can provide encouragement, and a learner can look up the answer to evaluate the correctness of an answer (Hattie & Timperley, 2007). The lesson plan should include constructive feedback and support to help learners assess their progress and improve their performance.

Social Interaction: Social interaction among students should be promoted. Vygotsky (1978) highlights the importance of cultural and social factors in shaping a person's cognitive growth. According to Vygotsky's theory of sociocultural development, social interaction is the foundation of learning. Vygotsky claims a child's cognitive development is strongly influenced by their social interactions and cultural context. He emphasised the importance of the Zone of Proximal Development (ZPD), where learning occurs through collaboration with more knowledgeable individuals. The relationship between student and teacher is therefore central to learning. Tu & Mcisaac (2002) identified social context, online communication and interactivity as the most important dimensions of social presence in building a sense of community among online learners. Privacy was also an important factor in online comfort for students (Tu & Mcisaac, 2002). Instructional design should encourage collaboration through group projects, discussions, and peer feedback to promote a sense of community and shared learning experiences.

Relevance: McTighe and Wiggins (2005) emphasise the importance of relating instructional content to real-life situations to make learning meaningful and practical for school-age learners. They argue that education should not only focus on the acquisition of isolated facts and skills,

but should instead aim to help students develop a deep understanding of essential concepts and the ability to apply their learning in authentic contexts. By connecting lessons to real-world problems, experiences, and applications, educators can increase curriculum relevance and motivate students by demonstrating the practical utility of what they are learning.

Emotional Well-Being: Marzano et al. (2003) emphasise the importance of considering students' emotional well-being, advocating for the creation of a positive and supportive learning environment where students feel safe and comfortable to express themselves without fear of judgement. They recognise that fostering a classroom atmosphere in which students feel valued and respected is critical to effective teaching and learning. By responding to students' emotional needs and building positive teacher-student relationships, educators can increase engagement, motivation, and overall academic success.

Technology Integration: According to Prensky's theory (2001), schoolchildren who grew up in the digital age, as digital natives, have a natural affinity for technology and a different cognitive processing style, which is shaped by their early exposure to digital tools. This highlights the need for educators to adapt their teaching methods to better engage and educate digital natives, using technology as a powerful learning tool.

Designing learning experiences that are tailored to the unique needs and characteristics of school-age learners can help create a positive and effective learning environment that contributes to students' holistic development and academic success while ensuring their overall well-being.

3.2 Definition of Learning Objectives

Two fundamental questions of the instructional design process are the following:

- What are the learning objectives? What must the learner know or be able to do at the end of this learning process?
- What is an appropriate design strategy to achieve these goals?

Learning objectives or instructional goals determine the expected outcome of each course and/or each individual learning unit. Learning goals are statements that clearly describe what learners should know, understand, or be able to do as a result of participating in a learning experience.

Learning objectives guide the development of instructional materials and activities. A learning objective is a statement that describes a competency or capability that the learner is expected to acquire.

According to the **revised Bloom's taxonomy of the cognitive domain (**Anderson & Krathwohl, 2001; Krathwohl, 2002; Wilson, 2016), learning objectives can imply six different types of cognitive performance. These are hierarchical in nature, with each level building upon the previous one. The six types of cognitive performance in the revised Bloom's taxonomy are:

- Remembering: This level involves recalling or recognizing information from memory. Learners are expected to recall facts, definitions, or concepts. Example action verbs associated with this level include "define," "list," "recall," or "identify."
- Understanding: At this level, learners demonstrate comprehension and interpretation of information. They are able to explain ideas or concepts, summarise information, or interpret data. Example action verbs include "explain," "describe," "summarise," or "interpret."
- Applying: Applying refers to using acquired knowledge or skills in new situations. Learners can apply concepts, theories, or principles to solve problems or complete tasks. Example action verbs at this level include "apply," "solve," "use," or "demonstrate."
- Analysing: This level involves breaking down complex information into its constituent parts and understanding the relationship between them. Learners can analyse relationships, identify patterns, or make connections between different ideas. Example action verbs associated with analysing include "analyse," "compare," "contrast," or "classify."
- Evaluating: Evaluating involves making judgments or assessments based on criteria and evidence. Learners can evaluate the validity, reliability, or quality of information, arguments, or solutions. Example action verbs at this level include "evaluate," "critique," "assess," or "justify."
- Creating: This is the highest level of cognitive performance in the revised Bloom's taxonomy. Creating involves generating new ideas, designing, or producing something original. Learners can create new concepts, products, or solutions. Example action verbs include "design," "compose," "produce," or "generate."

These levels provide a framework for designing learning objectives that reflect different levels of cognitive engagement and complexity. Learning objectives serve as a roadmap for designing and assessing instruction, providing clarity and focus on what learners should accomplish. By determining desired cognitive performance, instructional designers can direct instructional design and assessment strategies to create effective learning experiences that meet the desired outcomes and support learner success.

Learning objectives provide a clear focus and direction for instruction and serve as benchmarks for assessing learner achievement.To enable effective teaching and learning, learning objectives must be **well-defined**. Well-defined learning objectives guide the selection of appropriate teaching strategies and instructional methods. Learning objectives should:

- be concise and specific, clearly stating the intended knowledge, skill or attitude that learners should acquire, avoiding vague language.
- be written in such a way that learning success can be assessed and measured.
- describe what learners can do or accomplish (learner's desired behaviour) rather than simply stating what they will know or understand.
- be guided by broader learning outcomes or goals.
- be relevant to learners' needs and context.
- be realistic and achievable within the given lesson time frame and available resources.

For this purpose the **SMART** (Specific, Measurable, Achievable, Relevant and Time Bound) framework can be applied (SAMHSA, 2023). An effective learning objective should include the following 5 elements: who, will do, how much or how well, of what, by when:
MART stands for specific, measurable, achievable, relevant, and time-bound.

- Specific – what will be done and who will do it.
- Measurable – how the action will be measured.
- Achievable – Objective is realistic given the realities faced in the community.
- Relevant –Objective makes sense, i.e. it fits the purpose of the training program, the culture and structure of the community
- Time-bound –has a specific timeline for completion.

Learning activities and assessments included in a learning course must be **aligned** with the course's learning objectives. Having clear learning objectives allows for the development of

learning activities that really address learners' needs and form the basis for assessment tests. It is important to ensure that learning activities and assessments aim to develop and assess the same achievements and learning content as expressed in the learning objectives, i.e. they must be aligned with the learning objectives.

3.3 Instructional Design Theories

When designing eLearning courses for adult learners, several instructional design theories and models can be applied to create effective and engaging learning experiences. Here are some instructional design theories commonly used in eLearning for school-age learners:

Bloom's Taxonomy (Bloom, 1956; Krathwohl, 2002 and others)
Bloom's Taxonomy provides a hierarchical framework used for classification of educational learning objectives into levels of complexity and specificity. It categorises learning objectives into cognitive, affective and psychomotor domains.The cognitive domain list has been the primary focus of most traditional education and is widely used to structure curriculum learning objectives, assessments and activities. The cognitive area is divided into six levels of objectives: knowledge, comprehension, application, analysis, synthesis, and evaluation. eLearning designers use Bloom's Taxonomy to create assessments and activities that align with these levels

Constructivism (based on learning theories by Dewey, Piaget, Vygotsky and others (Mascolo, & Fischer (2005))
Constructivism emphasises active learning and building knowledge through learner experiences and interactions. In eLearning, designing courses based on constructivist principles could include providing opportunities for exploration, problem solving, collaboration and reflection. This could take the form of interactive activities and simulations that encourage learners to explore and discover knowledge. By engaging with the content, learners actively build meaning and understanding.

Connectivism (Siemens, 2005)
Connectivism emphasises the importance of networks and connections in learning. In the digital age, this theory suggests that learning is not just about what you know, but also about knowing where to find information. It recognizes the role of technology and highlights the need for learners to develop skills in navigating and using digital networks. Designing eLearning

courses using connectivist principles is about giving learners the opportunity to connect with resources, experts, and peers and build their personal learning networks.

Experiential Learning (Kolb, 2014)

Experiential learning focuses on the learning process through concrete experiences, reflective observation, abstract conceptualization, and active experimentation. eLearning courses, based on experiential learning principles, include simulations, case studies, real-world scenarios and hands-on activities that allow learners to apply their knowledge in practical contexts.

Social Learning Theory (Bandura, 1977)

Social learning theory examines how both environmental and cognitive factors work together to influence human learning and behaviour. This theory assumes that learners acquire knowledge and skills by observing and interacting with others. For elearning, this can include the inclusion of discussion forums, collaborative projects and peer learning opportunities

Cognitive Load Theory (Sweller & Chandler, 1991)

Cognitive load theory focuses on managing the cognitive load on learners. Designing e-learning courses based on cognitive load theory requires presenting information in a structured and organised manner, breaking content into manageable sections, and effectively using multimedia to support learning without overwhelming learners. The goal is to ensure that content is presented in a way that minimises cognitive overload and promotes effective learning.

Andragogy (Knowles, 1984)

Andragogy represents the foundation of adult education theory. It is described as the practice of teaching adults, as opposed to pedagogy, the practice of teaching children. Andragogy thus focuses on the unique characteristics and needs of adult learners. The application of andragogic principles involves encouraging self-directed learning, recognizing learners' prior knowledge and experiences, and tailoring learning to their needs and goals. Although primarily associated with adult learners, principles of andragogy, such as self-directed learning and relevance to real-world situations, can be applied to e-learning for school-age learners to make content more engaging and meaningful.

These instructional design theories can serve as a guide for designing and developing eLearning courses for economically vulnerable women, taking into account their unique characteristics, needs, and preferences. It is important to adapt and tailor these theories to specific learning contexts and to align them with desired learning outcomes and instructional goals.

3.4 Instructional methods

Expositive methods, application methods, and collaborative methods are three categories of instructional methods commonly used in eLearning programs (FAO, 2021). Each category targets a different aspect of learning: knowledge acquisition, skills development and social interaction respectively.

- **Expositive methods** emphasise the absorption of new information. Expositive methods involve providing information or content to learners. They focus on imparting knowledge and are often used to introduce new concepts or provide explanations. Expositive methods include presentations, case studies, working examples and demonstrations.
- **Application methods** emphasise the active processes learners use to perform procedural and principle-based tasks and build new knowledge. They are about giving learners the opportunity to apply the knowledge and skills they have acquired and focus on practical application, problem solving and critical thinking. Application methods include the demonstration exercise method, work aids, case-based or scenario-based exercises, role-playing, simulations and serious games, guided research and project work.
- **Collaborative methods** emphasise the social dimension of learning and encourage learners to share knowledge and complete tasks collaboratively. Collaborative methods emphasise interaction, collaboration and social learning between learners. These methods encourage learners to collaborate, share ideas and learn from each other's experiences. This includes guided online discussions, collaborative work and peer tutoring.

Instructional methods can be categorised according to the learning preferences of learners into three main categories:

- **Self-Paced Learning:** Self-paced learning methods provide learners with flexibility and autonomy, allowing them to progress through the course at their own pace. Examples include online modules, e-books and digital resources, online tutorials and videos.
- **Collaborative Learning:** Collaborative learning methods encourage interaction and engagement among adult learners and provide opportunities for the exchange of ideas,

perspectives and experiences. Examples of this are online discussion forums and virtual learning groups.

- **Teacher-led learning:** Teacher-led methods involve guidance and facilitation by teachers or subject matter experts. Examples include virtual, instructor-led training,

Depending on whether they include time-coordinated or time-independent activities, Instructional methods can be categorised into three main categories:

- **Synchronous teaching methods:** Synchronous methods involve real-time interaction between learners and instructors or between the learners themselves. These methods allow for instant feedback, collaboration and engagement. Examples of synchronous teaching methods are:
    - Live Virtual Classes: real-time, online classes where students and teachers interact through video conferencing or webinar platforms. It allows for immediate feedback and direct engagement, resembling a traditional classroom experience.
    - Chat and Discussion Forums: Synchronous discussions and chat sessions allowing students to ask questions, collaborate, and participate in group discussions, even when not physically present in the same location.

- **Asynchronous teaching methods:** With asynchronous methods, the learners do not have to be present at the same time. They offer flexibility of time and place, allowing learners to access and participate in materials at their convenience. Examples of asynchronous teaching methods are: self-paced modules, recorded lectures, online discussion forums.
    - Pre-recorded lectures, instructional videos, and multimedia resources made available to students for self-paced learning. This approach provides flexibility for students to access content when it suits their schedule.
    - Discussion forums and email communication allowing students to participate in discussions, seek clarifications, and submit assignments at their convenience, encouraging active participation and information sharing.
- **Mixed/hybrid teaching methods**: Mixed or hybrid methods combine both synchronous and asynchronous approaches, providing a balanced learning experience. This allows for a mix of real-time interactions and self-directed learning. Examples of mixed teaching methods are:

- Blended learning often involves a mix of live sessions and pre-recorded content, offering students flexibility while still allowing for real-time interaction with instructors and peers.
- Flipped Classroom, where: students access instructional materials and resources independently (asynchronously) before live sessions. Class time is then used for discussions, collaborative activities, and problem-solving, enhancing engagement and application of knowledge.

Instructional approaches may also vary depending on the learning delivery channel:

- **Electronic learning (eLearning)** describes learning conducted via electronic media, typically on the internet.eLearning is more suitable for in-depth learning and wider-ranging courses aimed at developing knowledge and skills
- **Mobile learning** (**mLearning**) provides learning content in small modular blocks on mobile devices (e.g. smartphones, tablets). This method can be particularly effective and appropriate when learners are in remote areas with poor internet connectivity or when they need quick assistance. mLearning is primarily intended to be used immediately at the point of need, and often serves as a performance support resource or job aid.(FAO, 2021).

Instructional designers can strategically select and combine these methods based on learning outcomes, content type, and learner characteristics to create effective and engaging eLearning experiences.

Instructional methods can be categorised according to the levels of Interactivity they support.

In online courses, **interactivity** refers to the level of engagement and interaction between the learners and the course content, instructors, and other learners. Higher levels of interactivity can enhance learner engagement, motivation, and comprehension. The level of interactivity may vary depending on factors such as the subject matter, instructional goals, resources, and technological capabilities:

- **No interactivity** (passive presence). The learner acts solely as a receiver of information.
- **Low Interactivity**: Online courses may offer limited interactivity. Learners primarily consume pre-recorded lectures or read static content without much opportunity for interaction or engagement. The course may lack opportunities for feedback, discussion, or collaboration between learners.

- **Moderate Interactivity:** Courses offer more opportunities for engagement and interaction. Learners may have access to discussion forums or chat features where they can ask questions, discuss concepts, or ask for clarification. Tests or assessments may be included to provide learners with feedback on their progress.
- **High Interactivity:** Courses include a variety of interactive elements and activities. This may include live virtual sessions, real-time discussions, group projects, simulations, case studies, interactive multimedia content and hands-on activities. Learners often have opportunities to interact with faculty and peers, receive instant feedback, and actively apply their knowledge.

The appropriate level of interactivity should be determined based on the learning objectives and the needs of the target audience.

3.5 Technostress management

Technostress in online education refers to the negative impact of technology use on a teacher's or student's well-being, including physical and mental health, work-life balance, and overall quality of life. This can lead to decreased **motivation**, burnout, and negative impacts on mental and emotional well-being, and negatively impact learning outcomes and performance. Increased dependence and exposure to the use of technology for distance education can jeopardise the **well-being of individuals** as the boundaries of school and personal life are harder to maintain and negatively associated outcomes and side-effects of technology use may arise, such as **stress from technology use** (Tarafdar et al. 2007). Technostress can affect both students and teachers. (Fuchs, 2021; Mokh et al., 2021; Chiu & Lapeyrouse, 2021; Mu et al., 2022; Nang, et al., 2022; Siddiqui et al., 2023; Yang et al., 2022).

3.5.1 Technostress risk analysis

Berger et al. (2023) study of **technostress in digital work** views technostress as a process that begins with the conditions of the technology environment that relate to attributes of specific ICT and represent a demand on the individual. Next, the person judges whether the request represents a threat or a challenge, indicating a technostressor. This then leads to a technostress response (i.e. physiological, psychological and coping responses). In the long term, the technostress response experienced can lead to serious negative consequences of technostress, including serious health impairments such as burnout, depression or exhaustion.

They propose a three-level **preventive technostress management** model. Prevention takes measures to inhibit technostressors, technostress responses, or adverse technostress outcomes.

- **Primary prevention** is aimed at modifying the organisational stressors that may eventually lead to stress (technostressor-directed).
- **Secondary prevention** aims at changing individual stress responses to necessary demands consisting of coping responses and psychological and physiological responses.
- **Tertiary prevention** attempts to minimise the amount of individual and organisational stress that results when organisational stressors and resulting stress responses have not been adequately controlled. It concerns the treatment, compensation, and rehabilitation of adverse individual or organisational technostress outcomes.

To sustainably reduce technostress, instructional designers must include ex ante measures when developing a learning scenario to prevent future stressful situations caused by technostressors. **Risk analysis** is a critical process for technostress mitigation or aversion. It includes three key phases: risk identification, risk assessment and risk mitigation. The first phase systematically identifies potential risks, taking into account a variety of factors that may impact the learning process. Subsequently, in the risk assessment phase, these identified risks are assessed in terms of their likelihood of occurrence and potential impact, allowing risks to be prioritised based on their importance. Finally, the risk mitigation phase develops and implements strategies and measures to either prevent identified risks from occurring or minimise their impact, ensuring a proactive and comprehensive approach to managing and reducing potential negative outcomes.

Overall, in distance learning technostress **can arise from a variety of sources,** such as difficulty adapting to new digital platforms and tools, information overload, technical problems and feelings of isolation. As new digital tools and platforms are introduced, teachers may need to learn new skills and ways of working. This can create stress, especially when the technology is complex or not user-friendly. Furthermore, with so much digital information available, identifying what is important can be difficult. This can leave teachers and students feeling overwhelmed and stressed. Technical issues such as system crashes, slow internet connections or device malfunctions can be frustrating and stressful as well. In addition, the extended use of technology in communication can lead to feelings of isolation and disconnection from others, especially when face-to-face interactions are reduced. The main

technology stressors (Donham et al., 2022; Aktan & Toraman, 2022) associated with the use of technology in online education include: technical difficulties (e.g. poor internet connection, hardware failure), time management and workload, difficulty in adapting to new digital platforms, lack of human interaction and social support, distractions and lack of concentration, information overload, difficulty in staying organised and motivated, feeling isolated and disconnected from classmates and trainers etc. Overall, technology stressors can be roughly divided into four main categories:

- **Technical challenges**: Difficulties with hardware, software, or internet connectivity.
- **Learning Challenges**: Adapting to new digital platforms, information overload and difficulty staying organised and motivated.
- **Social Challenges:** Lack of human interaction, social support and feelings of isolation.
- **Time Management Challenges**: Heavy workloads, difficulty balancing multiple responsibilities, and distractions.

The POSITIVE LEARN investigation into technostress situations in distance learning (R1 Report: Overview of European distance learning positification) identified three core themes and relevant mitigation strategies, namely technostress related to:

- **Technology use and network connections,** such as power cuts, empty batteries, scarcity of devices, hybrid learning situations etc.
- **Access to learning materials/educational content**, such as digital content being either too basic and unmotivating, or very disruptive, teachers' perceived lack of control over the digital content that students watch in classroom etc.
- **Professional development of teachers' mechanisms,** including their lack of technical skills, lack of motivation to use technology, the poor pedagogical support for teaching with technology during teacher education etc.

When developing a distance learning scenario it is important to assess and identify potential stressors and negative psychological impacts caused by the use of technology on teachers and students. It involves evaluating how technology, such as digital devices, software applications, or communication tools, may lead to stress, anxiety, and decreased well-being among participants in conjunction with the planned learning activities, the learning methods etc.. This analysis can help instructional designers understand the sources of technostress, develop strategies to mitigate its effects, and create a healthier and more productive technology-enabled environment.

To this end, a holistic view of various factors is required. The Technological Pedagogical Content Knowledge (**TPACK**) framework (Mishra & Koehler, 2006) for designing and implementing technology-enhanced learning activities emphasises the importance of considering the interaction between three primary forms of knowledge: (a) Technological knowledge (how to use technology for teaching and learning); (b) Pedagogical knowledge (how to teach and learn effectively); and (c) Content knowledge (related to the subject matter that is being taught). Other important relationships between knowledge forms include: Pedagogical Content Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge. Kali, et al. (2019).proposed an extension to the TPACK model, stressing that space plays an important role in both learning and teaching. Their Technology, Pedagogy, Content, and Spaces (**TPeCS**) Knowledge Framework is a model for understanding teaching expertise, taking into account various factors, including technology, pedagogy, content, and the learning environment or space.

Preventive technostress management strategies for distance learning can be categorised into **instructional design-related** (a) and **other**. Instructional design-related measures may include clear Learning Objectives, structured course design, user-friendly platforms, engaging Learning Activities, consistent communication modalities etc. Generic measures may include technical support, mental health resources, feedback channels, teacher training, cybersecurity guidance, peer support networks etc.

Relevant pedagogical interventions for the development of positive distance learning scenarios are included in R2.2 report (POSITIVE LEARN pedagogical framework).

This may include:

- adopting a student-centred approach, where active student engagement and autonomy are promoted through interactive learning activities and opportunities for self-directed exploration. prioritising inclusivity and diversity must be , acknowledging the varied needs and backgrounds of learners and ensuring equitable access to resources and support.
- emphasising learners' well-being and providing emotional support
- creating a sense of community and collaboration among students, even in virtual spaces, encourages peer-to-peer interaction, mutual support, and the sharing of diverse perspectives, enriching the overall learning experience and enhancing students' sense of belonging.

The Technostress Risk Analysis process is summarised in the following table.

Table: Technostress Risk Analysis process

Step	Action	Description
1	Identification of Potential Risks	List potential sources of technostress, such as technical issues, information overload, or digital distractions, etc.
2	Impact Analysis	Evaluate the potential impact of these risks on students' and teachers' well-being, motivation, and learning outcomes.
3	Identification of Technostress Mitigation Strategies	**Proactive Measures:** Actions that can be taken to prevent technostress, including clear communication, providing technical support resources, and setting realistic expectations. **Responsive Measures:** Strategies to address technostress as it arises, such as offering stress reduction techniques, flexible deadlines, and alternative assessment options

3.5.2 Teacher competences

An important area to consider when discussing mitigation of technostress is **teacher competencies.** Overall, educators need to learn how digital environments and resources can enhance and impact their teaching practice and learning experience. They must be able to integrate new technologies and use devices appropriately and effectively. This requires distinctly different skills and competencies to function effectively in the classroom and respond to the demands of the 21st century. To better deal with technostress, educators need support that spans several areas, ranging from professional development opportunities to technical, peer and administrative support, and access to mental health resources (Whalen, 2020; Dennis, 2021; Daneshmand et al., 2022). Access to training and professional development programs can help teachers develop the competencies they need to effectively integrate technoogy into their classroom. Availability of technical support staff can help resolve technical issues and provide assistance with digital tools and platforms. Opportunities to collaborate with colleagues will allow teachers to exchange ideas, experiences and strategies for coping with technostress (learn from others' experiences and knowledge, solve problems related to technology use, receive social support). Support from school administration is needed in terms of providing adequate resources, reducing workload and recognizing the importance of managing technostress. To this end, the availability of mental health resources, training and support for teachers struggling with technostress is critical. In addition, teachers need a

combination of **technical, pedagogical, and social and emotional competences** to better deal with technostress.

The competences teachers need for technostress mitigation are discussed in detail in R2 Competences Framework Report. These include:

- Knowledge of technostress risks and mitigation strategies.
- Ability to identify technostress risks in distance learning scenarios.
- Ability to design distance learning scenarios that mitigate technostress risks.
- Ability to support learners who are experiencing technostress.
- Ability to protect themselves from experiencing technostress.

4. TECHNOSTRESS ANALYSIS CANVAS

The following figure (Fig. 3) shows our proposed **Technostress Analysis Canvas**, a visual framework designed to help analyse and address technostress for distance learning lesson design purposes. It serves as a structured approach to understand, analyse, and address technostress systematically, making it a valuable tool for instructional designers looking to create healthier and more productive digital learning environments. The Technostress Analysis Canvas includes a set of interrelated sections or components to assess the impact of technology-related stressors and develop strategies for mitigation.

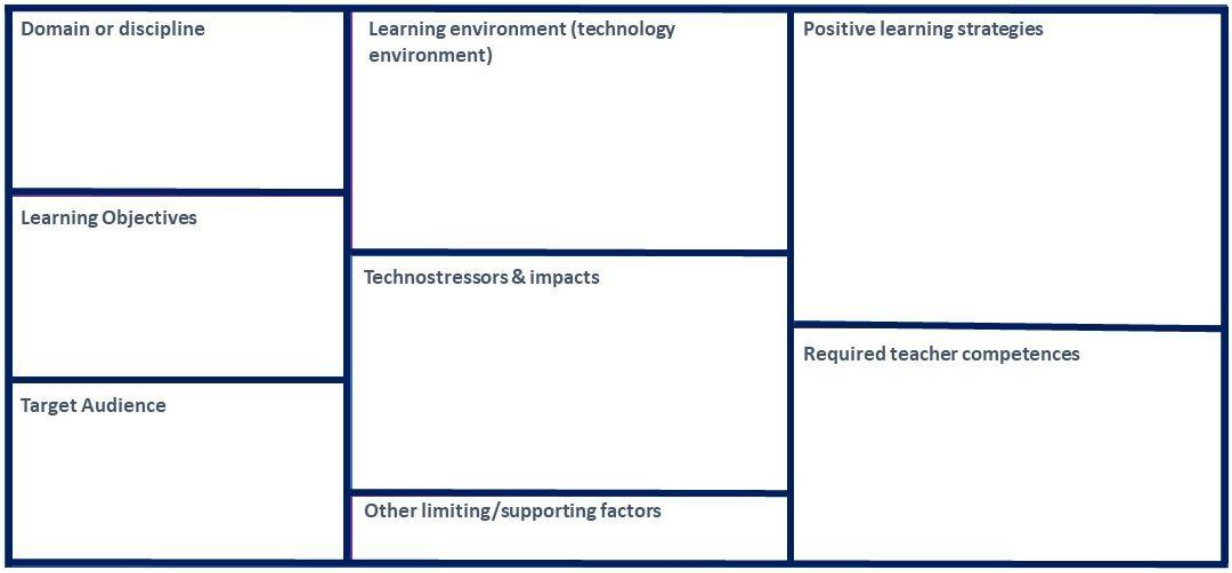

Figure 3: Technostress Analysis Canvas

The key components of the Technostress Analysis Canvas are detailed in Table 2.

Table 2: Key components of the Technostress Analysis Canvas

Component	Important aspects
Learning Objectives	What will the learners learn from this scenario? What do the learners need to accomplish at the end of the program? What are the desired learning outcomes in terms of knowledge, skills, attitudes, behaviour etc.?
Target Audience	Who is this scenario for? What are the learners' needs and interests?
Learning environment-Technology Environment	*Determining the various options available with respect to the learning environment:*

Component	Important aspects
(i,e. Distance Learning Context)	How will the scenario be delivered to learners? What platform will the scenario be delivered on? What tools and resources will be needed? How will learners interact with the scenario? In which space will learning take place on the learner side? Are there any additional actors involved? (e.g.facilitators)
Technostressors & impacts (technostressors Identification and impact analysis)	*Identifying the specific technology-related stressors or sources of technostress that teachers or students may experience analysing and rating the impact of each identified technostressor on individuals or the learning process:* What technostress risks are present in the scenario? What is the potential impact of these risks on students and teachers?
Other limiting/supporting factors	*Determining limiting/supporting factors to the overall goal of the project:* What limiting/supporting factors exist with respect to e.g.resources, including technical, support, time, human resources, technical skills, financial factors, support factors?
Positive learning strategies	What positive learning strategies can be incorporated into the scenario to prevent or mitigate technostress? What is the focus of these positive learning strategies? • To foster collaboration and support (Teacher-student and peer relationships)? • Promotion of Individual emotional well-being? • Selection of suitable teaching methods for student-centred learning (effectiveness of learning)?
Required teacher competences	What competences do teachers need to deal effectively with technostress?

5. DEVELOPMENT OF POSITIVE DISTANCE LEARNING SCENARIOS

Learning scenarios can vary significantly depending on factors such as the subject matter, the age and needs of the learners, the learning objectives, the resources available, the teaching methods used etc.. There are various learning scenario templates that can be used to create structured learning scenarios for face-to-face or distance learning. For example, the **European School Education Platform** includes teaching materials and courses created in European projects, including learning scenarios[1]. The **Scientix** community for science education in Europe offers online courses, webinars, and resources for science and mathematics educators[2]. The **Photodentro** learning scenario repository and learning scenario designer tool provide customisable templates for developing learning scenarios in various application domains (Megalou et al., 2022). **MITIDA** is a service for the production, recomposition and distribution of learning scenarios using the open digital resources of the Greek National Documentation Centre.[3]

Learning scenario templates provide a structured framework to help instructional designers create effective and organised learning experiences. There cannot be a general or uniform template for learning scenarios that is universally applicable to every educational context and every learning situation. Instructional designers can create or select templates that best fit their specific goals and constraints. Selected learning scenario templates can be customised to reflect a teacher's individual teaching style, the needs of their learners and the learning context. In this process it is important to ensure that the template helps structure the learning experience effectively and efficiently.

Positive distance learning scenario templates

The purpose of a positive distance learning scenario template is to create a supportive and user-friendly online learning environment that can help mitigate the risks of technostress. It aims to reduce the anxiety and frustration learners or teachers may experience when using digital tools and platforms as part of the learning process.

Existing distance learning scenario templates may not explicitly consider the potential impact of technostress on learners and teachers. Instructional designers or educators need to

[1] https://www.schooleducationgateway.eu/en/pub/teacher_academy/teaching_materials.htm
[2] https://www.scientix.eu/resources
[3] http://scenaria-ekt.mitida.gr

customise and adapt a given template to also address the challenges of technostress to create healthier and more productive digital learning environments. The aim is to ensure that technology enhances the learning experience rather than causing unnecessary stress or frustration to learners or teachers.

In this report, we focus on developing positive distance learning scenarios, looking at the first two phases of the ADDIE instructional design process: Analysis and Design. To develop positive distance learning experiences, the instructional designer should first use the Technostress Analysis Canvas (Section 4) to analyse and assess the impact of technology-related stressors and develop strategies for technostress mitigation. These strategies must then be integrated into the specific learning scenario template used, depending on the actual learning context, the learning domain, the learning objectives etc..

Figure 4 illustrates the complete ADDIE instructional design process for positive learning experiences.

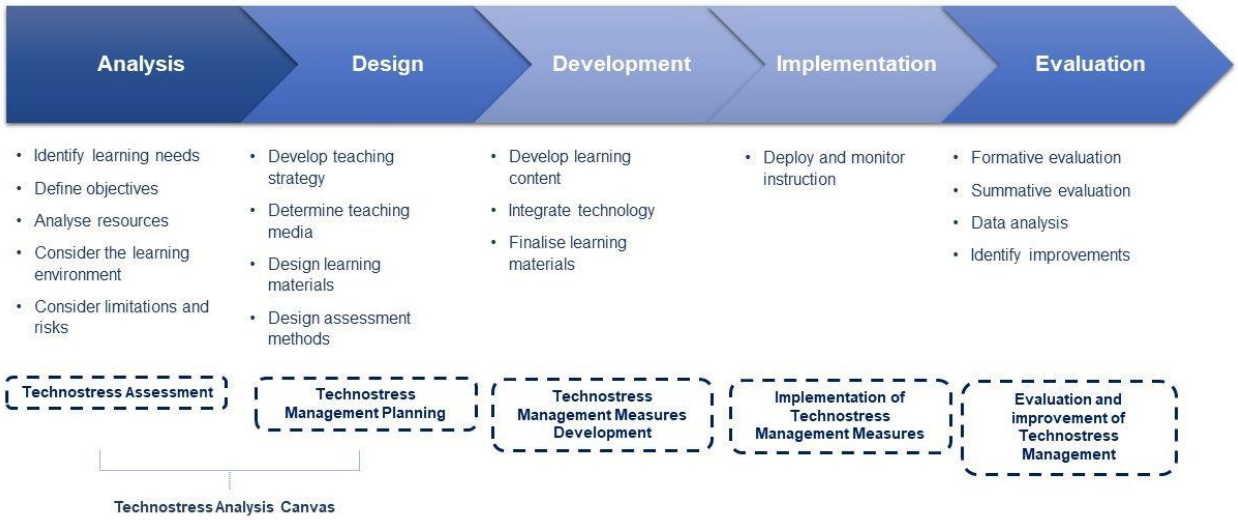

Figure 4: The ADDIE instructional design process for positive learning

The complete process for the development of positive distance learning experiences includes the following actions with regards to technostress management:

Table 3: Key components of Technostress Management per ADDIE phase

ADDIE model phase	Technostress mitigation objective	Action
Analysis Phase	**Technostress Assessment**	Conduct a technostress assessment to understand the potential stressors and challenges learners or teachers may encounter when using digital tools and online platforms for learning.
Design Phase	**Technostress Management Planning**	Incorporate technostress management strategies into the learning scenario template (design positive learning strategies)
Development Phase	**Development of Technostress Management Measures**	Develop positive learning measures (low technostress learning activities, complementary technostress-reduction activities or resources etc.) according to the planned positive learning strategies
Implementation Phase	**Implementation of Technostress Management Measures**	Implement proactive positive learning measures to prevent technostress. Monitor technostress and, if needed, implement responsive positive learning measures accordingly
Evaluation Phase	**Evaluation and improvement of Technostress Management**	Evaluate the effectiveness of Technostress Management and make necessary improvements

Below is an example template for a **positive distance learning scenario**, i.e. a distance learning scenario template. It illustrates the incorporation of positive learning interventions into learning scenario design.

Based on the above, it is clear that technostress prevention provisions should be considered in several areas of a learning scenario template. Below is a sample positive scenario template for distance learning. A similar approach should be followed for the adaptation of any given learning scenario template.

Scenario Title:

Scenario Overview

Domain or discipline:

Learning Objectives:

- What will the learners learn from this scenario?
- What do the learners need to accomplish at the end of the program?
- What are the desired learning outcomes in terms of knowledge, skills, attitudes, behaviour etc.?

Target Audience:

- Who is this scenario for?
- What are the learners' needs and interests?

Duration:

- How much time is expected to take to complete?

Learning environment

Distance Learning Context:

- How will the scenario be delivered to learners? What platform will the scenario be delivered on?
- What tools and resources will be needed?
- How will learners interact with the scenario?
- In which space will learning take place on the learner side?
- Who are the actors involved? (facilitators)
- How will technostress mitigation be addressed in this distance learning setting? (technology configuration,technology use and network connections)

Learning Activities

Scenario Events:

- What are the key events that happen in the scenario?
- How will learners interact with the content and activities?
- What positive learning strategies are incorporated into the scenario to prevent or mitigate technostress?
- What is the focus of these positive learning strategies?
    - Foster collaboration and support (Teacher-student and peer relationships)
    - Promotion of Individual emotional well-being
    - Selection of suitable teaching methods for student-centred learning (effectiveness of learning)

Evaluation & Feedback

Assessment:

- How will you assess learners' learning?
- How will you provide feedback to learners on their performance?
- How will you assess the effectiveness of technostress mitigation?

Debriefing:

- How will you help learners reflect on their learning?
- What questions will you ask them to think about?
- How will technostress mitigation be discussed in the debriefing?

Other

Other limiting/supporting factors:

- What limiting/supporting factors exist with respect to e.g.resources, including technical, support, time, human resources, technical skills, financial factors, support factors?

Competences Teachers Need for Technostress Mitigation:

- Knowledge of technostress risks and mitigation strategies.
- Ability to identify technostress risks in distance learning scenarios.
- Ability to design distance learning scenarios that mitigate technostress risks.
- Ability to support learners who are experiencing technostress.
- Ability to protect themselves from experiencing technostress.

6. REFERENCES

Anderson, L. W. and Krathwohl, D. R., et al (Eds..) (2001) A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon. Boston, MA (Pearson Education Group)

Aktan, O., & Toraman, Ç. (2022). The relationship between Technostress levels and job satisfaction of Teachers within the COVID-19 period. Education and Information Technologies, 27(7), 10429-10453.

Bandura, A. (1977). Social learning theory. Englewood Cliffs, NJ: Prentice Hall.

Berger, M., Schäfer, R., Schmidt, M., Regal, C., & Gimpel, H. (2023). How to prevent technostress at the digital workplace: a Delphi study. *Journal of Business Economics*, 1-63.

Bloom, B.S. (Ed.), Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook 1: Cognitive domain. New York: David McKay.

Bonwell, C. C., & Eison, J. A. (1991). Active learning: Creating excitement in the classroom (ASHE-ERIC Higher Education Report No. 1). ERIC Clearinghouse on Higher Education.

Chiu, B., & Lapeyrouse, N. (2021). Student Experiences and Perceptions of Emergency Remote Teaching. In Advances in Online Chemistry Education (pp. 123-134). American Chemical Society.

Daneshmand, A., Harris, M., & Viviani, D. A. (2022). Roadmap to emergency remote teaching. New Directions for Community Colleges, 2022(199), 49-62.

Dennis, M. (2021). Best practices for emergency remote teaching. In Handbook of Research on Emerging Pedagogies for the Future of Education: Trauma-Informed, Care, and Pandemic Pedagogy (pp. 82-100). IGI Global.

Donham, C., Barron, H. A., Alkhouri, J. S., Changaran Kumarath, M., Alejandro, W., Menke, E., & Kranzfelder, P. (2022). I will teach you here or there, I will try to teach you anywhere: Perceived supports and barriers for emergency remote teaching during the COVID-19 pandemic. International journal of STEM education, 9(1), 1-25.

FAO (2021). E-learning methodologies and good practices: A guide for designing and delivering e-learning solutions from the FAO elearning Academy, second edition. Rome. https://doi.org/10.4060/i2516e

Fuchs, K. (2021). Lessons learned: A comparative study about the perceived satisfaction of emergency remote teaching in Thailand. International Journal of Information and Education Technology, 11(12).

Hattie, J., & Timperley, H. (2007). The power of feedback. Review of Educational Research, 77(1), 81-112.

Kali, Y., Sagy, O., Benichou, M., Atias, O., & Levin-Peled, R. (2019). Teaching expertise reconsidered: The technology, pedagogy, content and space (TPeCS) knowledge framework. British Journal of Educational Technology, 50(5), 2162-2177.

Kapaniaris, A. G. (2020). Folk Culture and Enriched Digital Teaching: Designing Educational Scenarios With the Use of ICT. In Handbook of Research on Tools for Teaching Computational Thinking in P-12 Education (pp. 484-505). IGI Global.

Kapp, K. M. (2012). The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education. Pfeiffer.

Knowles, M. S. & Associates. (1984). Andragogy in Action. San Francisco: Jossey-Bass

Kolb, D. A. (2014). Experiential learning: Experience as the source of learning and development. FT press.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into practice*, *41*(4), 212-218.

Marzano, R. J., Marzano, J. S., & Pickering, D. (2003). Classroom management that works: Research-based strategies for every teacher. ASCD.

Mascolo, M. F., & Fischer, K. W. (2005). Constructivist theories. Cambridge Encyclopedia of Child Development (pp. 49-63). Cambridge, England: Cambridge University Press.

Mayer, R. E. (2009). Multimedia learning (2nd ed.). Cambridge, England: Cambridge University Press.

Mayer, R.E., & Moreno, R. (2003). Nine Ways to Reduce Cognitive Load in Multimedia Learning. Educational Psychologist, 38, 43 - 52.

McTighe, J., & Wiggins, G. (2005). Understanding by Design. Association for Supervision and Curriculum Development.

Megalou, E., Alexandris, K., & Oikonomidou, E. (2022). THE PHOTODENTRO LEARNING SCENARIO REPOSITORY AND LEARNING SCENARIO DESIGNER TOOL: AN ONLINE ENVIRONMENT FOR CREATING, ORGANIZING, AND SHARING STRUCTURED LEARNING SCENARIOS AND CUSTOMIZABLE TEMPLATES. In EDULEARN22 Proceedings (pp. 4550-4560). IATED.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). Learning in adulthood: A comprehensive guide (3rd ed.). San Francisco: Jossey-Bass.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers college record, 108(6), 1017.

Mokh, A. J. A., Shayeb, S. J., Badah, A., Ismail, I. A., Ahmed, Y., Dawoud, L. K., & Ayoub, H. E. (2021). Levels of technostress resulting from online learning among language teachers in Palestine during Covid-19 pandemic. American Journal of Educational Research, 9(5), 243-254.

Molenda, M. (2003). In search of the elusive ADDIE model. Performance improvement, 42(5), 34-37.

Mu, E., Florek-Paszkowska, A., & Pereyra-Rojas, M. (2022). Development of a Framework to Assess Challenges to Virtual Education in an Emergency Remote Teaching Environment: A Developing Country Student Perspective—The Case of Peru. Education Sciences, 12(10), 704.

Nang, A. F. M., Maat, S. M., & Mahmud, M. S. (2022). Teacher technostress and coping mechanisms during COVID-19 pandemic: A systematic review. Pegem Journal of Education and Instruction, 12(2), 200-212.

Piaget, J. (1972). The Psychology of Intelligence. Routledge

Prensky, M. (2001). Digital natives, digital immigrants part 2: Do they really think differently?. On the horizon, 9(6), 1-6.

SAMHSA (2023). Setting goals and developing specific, measurable, achievable, relevant, and time-bound objectives. SAMHSA (Substance Abuse and Mental Health Services Administration) , U.S. Department of Health and Human Services. Available at: https://www.samhsa.gov/sites/default/files/nc-smart-goals-fact-sheet.pdf

Scarpellini, F., Segre, G., Cartabia, M., Zanetti, M., Campi, R., Clavenna, A., & Bonati, M. (2021). Distance learning in Italian primary and middle school children during the COVID-19 pandemic: a national survey. BMC Public Health, 21.

Siddiqui, S., Arif, I., & Hinduja, P. (2023). Technostress: A catalyst to leave the teaching profession-A survey designed to measure technostress among teachers in Pakistan during COVID-19 pandemic. E-Learning and Digital Media, 20(1), 53-79.

Siemens, G. (2005). Connectivism: Learning as network-creation. ASTD Learning News, 10(1), 1-28.

Sweller, J., & Chandler, P. (1991). Evidence for cognitive load theory. Cognition and instruction, 8(4), 351-362.

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. Journal of management information systems, 24(1), 301-328.
Tomlinson, C.A. (1995). How to Differentiate Instruction in Mixed-Ability Classrooms.

Tu, C., & Mcisaac, M.S. (2002). The Relationship of Social Presence and Interaction in Online Classes. American Journal of Distance Education, 16, 131 - 150.

Vygotsky, L.S. (1978). Mind in Society: The Development of Higher Psychological Processes: Harvard University Press.

Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. Journal of Technology and Teacher Education, 28(2), 189-199.

Wilson, L. O. (2016). Anderson and Krathwohl–Bloom's taxonomy revised. *Understanding the New Version of Bloom's Taxonomy*.

Yang, Y., Liu, K., Li, M., & Li, S. (2022). Students' affective engagement, parental involvement, and teacher support in emergency remote teaching during the COVID-19 pandemic: Evidence from a cross-sectional survey in China. Journal of Research on Technology in Education, 54(sup1), S148-S164.