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ORIGINAL PAPER

The Development of Learning Strategies during Technical English Classes

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Abstract:
The current paper proposes a student-oriented strategy for the development of learning skills during ESP classes. The need for the current research stems from the observations gathered during ESP classes according to which few students are aware of their current learning strategies. Moreover, students seldom realise how their active and passive learning differ from their peers' learning and that they can gradually and actively improve their learning strategies. The aim of this paper is to identify the specificity of technical English study and to forward a set of practical solutions to the challenges of ESP instruction that have the potential to upgrade students' learning outcome.

Keywords: *Active learning, learning strategy, passive learning, student-oriented approach, Technical English classes.*

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1. Introduction

In post-communist education there has been a remarkable shift in understanding the development of learning in the sense that educational success is no longer perceived as 'a construct of ability' and is now being viewed as resulting from 'appropriately guided effort' (Dweck, 1999: 15). There is evidence indicating that effective learning occurs when students explicitly develop awareness of learning strategies and techniques, specifically when these are aimed at the metacognitive level (Hoyle & Davisson, 2011; Yeager & Walton, 2011). The increment of learning capabilities is, as a result, closely associated with *learning to learn*, the increase of student autonomy, the development of *independent learning skills* together with the *transfer of learning* across contexts. As teaching methodologies are shifting focus from teacher-centered to student-centered, learning results are ultimately being broken down to the role played by individuals in optimising their learning performance and outcome. And since teaching is not prescriptive and is unable to deliver the same results for all learner typologies, students are becoming increasingly involved in outperforming themselves. Technical English students as well can largely benefit from an increase in the awareness of which learning strategies seem to be working for them. During ESP classes, students are focused on improving their overall performance of general English and technical vocabulary in contexts and situations that pertain to the object of the ESP class: technical, medical, business etc. They may also be keen on developing learning strategies that help them produce better outcomes, bear relevance to their future professional lives and help them become independent learners.

The concept of ***learning skills*** is often used to depict the variety of techniques employed to acquire knowledge and develop new skills, in an environment that is characterized by formal learning, be it a school or university. Rychen & Salganik (2003: 44) make reference to the internal structures of a competence as the manifestations of 'Knowledge, Cognitive skills, Practical skills, Attitudes, Emotions, Values and ethics and Motivation'. Apart from academic contexts, learning often occurs in non-formal surroundings that are either generated by the student or circumstantial in nature. For instance, technical students often watch video tutorials that help them do their school assignments or simply out of technical curiosity, watch or read technical reviews before purchasing technology, attend technology fairs etc. All these can represent an important source of learning as most of these contexts are available only in English.

The education specialists attending the Council of Europe (1997) symposium furthered the proposal that competencies that stand at the foundation of skill development be regarded 'as the general capability based on knowledge, experience, values, dispositions which a person has developed through engagement with educational practices (1997: 26). Rychen & Salganik futher dwell into the definion of competence (2003: 43) 'as the ability to successfully meet complex demands in a particular context through the mobilisation of psycho-social prerequisites (including cognitive and non-cognitive aspects)'. Competences are viewed as the 'internal mental structures in the sense of abilities, dispositions or resources embedded in the individual' and are triggered by a 'specific real world task or demand'. Consequently, if improved learning is desired, one must work at possessing competence and helping it surface by exposing themselves to situations in which competence can manifest itself relevantly.

Moreover, the ultimate goal of developing learning skills or acquisition capabilities is to produce enhanced and optimized subsequent learning, i.e. to produce

skills that students find relevance for and make good use of in expanding knowledge further. In other words, students must be helped to become autonomous learners by seeking relevance and extension of the learnt content, by taking active charge of their subsequent learning and by not relying exclusively on what has been taught during a lesson and further feed their curiosity through research, extra practice etc. There are two main ways in which learning skills can be further developed by **improving the effectiveness of study** and **learning routines** which will yield palpable learning results and by **improving specific competence** – such as literacy, comprehension, inference or critical thinking – which will constitute a sound foundation or act as the prerequisites for deeper learning and skills transfer across subjects.

2. Transitioning knowledge into skill

There has been heated debate regarding the limitations of terminology in capturing the essence of students' learning evolution how *education* and *training* develop and change an individual's ability to benefit from what they have learned in their subsequent professional lives. As pointed out by Bălănescu (2021) ESP students will seek and find appropriate integration into communities of thought when and if their needs analysis includes information about language practice environments, in other words if trained to communicate in environments that bear resemblance to what they will encounter in their professional lives: '(…) learners' ability to communicate is the main condition of their participation in future communities of practice. As a result, classroom activities are meant to derive from the information offered by needs' analysis, and are designed as the actual or approximate versions of real activities' (2021:95)

The term **skill** itself has been under scrutiny for its limiting perspective on learning and performance (Higgins & Baumfield, 2004) and regarding what constitutes transferable skills and how they can be transitioned to meet the needs of students as professionals in their chosen domain (Bridges, 1993). The key issue and one of major concern is that students who perform well academically are not necessarily equipped to pursue their goals on a practical level and. There is often great discrepancy between acquired knowledge and professional success when knowledge is not paired with practical applications, the search for relevance and an independence of thought. This matter poses great relevance for technical students who are in dire need of exposure to experimental contexts in which knowledge is applied practically to render a sense of its relevance and later on become transferable to related or unrelated situations in the workplace. Moreover, from the earliest stages of development technical students need to become independent learners, harness their curiosity about their field of choice, fill in knowledge gaps on their own and build critical thinking.

Bridges (1993) notes that transferable skills are, in fact, the most fundamental to success after thoroughly analysing the underlying notions of cross-curricular, generic, core skills. Knowledge and skill are relevant as long as individuals possess the ability to perceive their applicability and adapt, modify and transfer them to a number of other social or cognitive domains in their lives and use them in a wide range of situations. When working with technical students, these findings are of utmost interest in the sense that students gradually become aware of the fact that all the technical knowledge and skills they acquire during their academic years will never be used exactly as they were taught and learnt but rather they represent bricks to be made use of in building customised structures of thought and action. In this regard, it is only by constantly practising awareness, adapting and altering structures of thought, skill and knowledge

can these be made relevant to any given context at any given time. Similarly, Stephenson (1992: 1) emphasises that the concept of '***capability*** depends much more on our confidence that we can effectively use and develop our skills in complex and changing circumstances than on our mere possession of those skills'.

When skills and knowledge are referred to and perceived as a commodity which can be accumulated, much of the applicability of knowledge is lost. What students do often fail to understand is the fact that teachers are present in class not only to deliver knowledge, but also to stimulate curiosity that students need to perceive as an opportunity and help in the development of skills that are to be refined by students who put them to good use. Instead of being fed information, students need activation to engage in learning as a form of participation to discussions, groups, communities, domains etc. Thus, knowledge delivery cannot replace the importance of learners as actively engaged individuals. For it is only when students are engaged that knowledge pairs with experience and acquires relevance and transfer capability.

Any given human is the sum of their experiences internalized in a way that is specific to the cognitive and personality traits and translated into behavior in an equally unique manner. According to Sfard (1998) the engagement of the students can be equated to a 'linguistic turn' which 'suggests that the learner should be viewed as a person interested in participation in certain kinds of activities rather than in accumulating private possessions' (1998: 6). In the same author's view, learning is associated to becoming a member of a community of knowledge, speaking the language of that community and joining in the activities according to the condoned social and cultural norms with significant social, cultural and situational specificity. Both acquisition and participation possess great value and, 'when combined together, run a good chance of gratifying all our needs without perpetuating the drawbacks of each one of them'. Differently put, when knowledge is put to work in socially driven learning contexts, no knowledge is wasted and a community of thought emerges from people who exchange ideas, find solutions to challenges, react and interact.

Stephenson (2000:2) carries on this line of analysis by discussing how autonomy and independence are achievable. He defines ***capability*** as '...an all round human quality, an *integration* of knowledge, skills, personal qualities and understanding *used appropriately and effectively* – not just in familiar and highly focused specialist contexts but in response to new and changing circumstances'. (author's italics). The affective as well as the cognitive dimension play a significant role in providing appropriate responses to ever-changing situations. The author further suggests that ***capable*** people have confidence in their ability to 'take effective and appropriate action within unfamiliar and changing circumstances'. Consequently, students need to develop the ability to expect the unexpected, in other words, to be mentally, cognitively and emotionally prepared to react to challenges using the knowledge they possess and the skills they have developed through their learning activities.

Thinking is believed to represent an invisible process instantiated in the mind. Nonetheless, when this process is highlighted in some visible way, it increases students' awareness of the thinking process itself, allowing them to become more independent as they start making make conscious decisions about the thinking they are now able to investigate. Moreover, when thinking is made visible, students inherently understand that it is a key part of the learning process (Tishman & Palmer, 2005). A possible solution for making thinking visible is by means of thinking routines in the form of

tools, structures, and patterns of behavior that model the thinking process (Ritchhart, Church & Morrison, 2011).

When developing critical thinking skills, students need to be encouraged to be diplay reasoning capacity and to be reflective. This can be done by providing opportunities to compile new knowledge with previously existing knowledge, by creating logical sequencing of data, expansion patterns and decision making. Also, it is essential that tasks be purpose-driven in the sense that students must see an application to the outcome. Additionally, multiple points of view should be presented on the topics covered, so students can analyse and decide what to believe in.

3. Active and Passive learning

Most of the world is conceptualized inside the human brain as a result of passive and active learning combined. While passive learning derives from being exposed to realities, phenomena, behaviours or mere knowledge, it is active learning that clarifies, expands and deepens our understanding of the afore mentioned realities. One question arises: should teachers allow students to explore concepts and subsequently offer instruction, or should the teaching occur first and then let students actively explore? The following chart offers a crystalised view of the question with its associated challenges:

Passive learning first	**Active learning first**
Knowledge, cognitive input provided	Teacher provides prompts, schematics for experiments
Tasks- completed by students	Students explore solutions, test them, refine experiment, ask questions, investigate
Evaluation + feedback	Students conceptualise, formulate thesis-abstractisation of experimental data
Students do not take active charge to research concepts further	Students research further to validate/ falsify assumptions, disseminate results, ask more questions, engage in peer discussions and debates, promote the experience
	Students seek to replicate the experience in the future

While it might seem obvious that all instructors desire to have students who are keen on active learning, i.e. students who ask questions, challenge norms and investigate further, research indicates that active learning may not be made possible or is rendered irrelevant in the absence of passive learning (Grabinger & Dunlap: 1995; Markant & Gureckis: 2014). The assumption made by students who have not been provided with input is that they will either freeze and not know how to approach the task since they have not been provided with background knowledge. Markant & Gureckis (2014) demonstrate how active exploration was particularly ineffective when there are discrepancies between the target concept and previously existing hypotheses. In other words, students become active learners when the passive input is sufficient to convey deep understanding of the concept and/ or task to a level that triggers students to take autonomous charge of exploring further. In fact, work carried out by Thai (2015) argues

in favour of receiving passive instruction prior to performing active classifications as this has the potential to uplift perceptual classification learning and abstractisation. To the technical English teacher, the challenge remains how to select appropriately calibrated input in a way that will provide sufficient baseline knowledge to act as foundation for perceptual classification while steering away from the temptation of providing too much cognitive input that would paralyse students' initiative to research further and thus trigger active learning. Addionally, when relevant cognitive input is offered first, we believe it would allow technical students to optimize the selection of appropriate proof, examples, and questions during active learning and increase their overall learning performance.

When active learning precedes passive learning it gradually expands understanding from the level of experiment to the level of hypothesis, from the concrete to the abstract, which is a valuable tool in technical language instruction. This, in turn, creates the challenge of generating the right examples to falsify the learner's current hypothesis in a way that encourages them to try multiple solutions and test them until a thesis can be extracted from the experimental content. When active learning occurs first, it has been noticed to encourage students in generating improved attention span and memorisation strategies, which can then be put to good use during passive learning activities.

In defense of the approach in which active learning precedes passive instruction, researchers such as Westermann & Rummel (2012) dwell on the concept of *productive failure* and demonstrate that creating particular learning situations in which students are forced to struggle with a task (problem solving, critical thinking) can yield better outcomes for subsequent instruction. In problem-solving situations, failure to produce a solution immediately behaves as an activator of creativity, self-reliance and motivation booster. In a way, this approach is similar to throwing children at the deep end to force them to learn how to swim. Barbaric as it may seem, it is in the presence of adversity that the human brain and body perform at their best. Instinctive resources start to surface, the adrenaline creates a multitude of alternatives in the process of solution seeking and the validation provided by succes generates the desire to replicate the situation in the future.

4. Raising awareness of students' own learning strategies

Though language classes are presumed to be focused on the development of information and communication skills, there is a fair degree of reasoning, self-management and interpersonal skills that are developed as well. During technical English classes, it is even more prevalent to use deduction, problem-solving and reasoning to expand knowledge and improve performance especially as most of the topics approached are hyper-specialised and they are used as core data for increasingly complex structures of knowledge. Since the ability to use existing information to solve problems and make decisions is highly valued in the results-oriented world of today (Zwiers & Crawford, 2011) there is stringent need for a shift towards emphasizing critical thinking in education.

Critical thinking is often applied to real world language use in students' personal lives and in whatever discipline they choose to follow (Brookhart, 2010). In actual fact, a large proportion of employers claim that, in recent years, among the most valuable skills they have been looking for in potential employees is the capacity to think critically and independently (Taylor, 2010). As we are preparing technical students to

join the labour market, language classes should be aimed at developing more than mere linguistic competence and performance. Through carefully selected activities language students can learn to develop mechanisms of questioning and expanding knowledge, finding relevance and transfer opportunities, pairing cognitive with the metacognitive.

In raising awareness of one's learning strategies, students are oblivious of how they should reflect on their working/learning strategies. In helping technical students become more knowledgeable about which factors can increase their productivity and learning outcomes as well as what are the ways in which they can transition from passive to active learning, we have devised a self-observation chart that aims at clarifying which aspects of learning students are currently experiencing and which aspects they can improve if their goal is to learn more efficiently.

The self-observation chart below derived from closely analysing the most common manifestations of students' learning tribulations and the factors that might hinder the acquisition of knowledge and the performance of skill. It has also drawn inspiration from Report Cards that are used in some Canadian schools and in most British schools for all levels of education to provide teacher-student or teacher-parent feedback on the academic performance of students in class. In transforming a report card into a self-observation chart for university students the aim was to make students aware of what criteria are used for evaluating learning performance and use these criteria for building improved learning styles that may render optimized learning outcomes. In other words, the purpose of the chart is to optimise metacognition and give way to further development of learning skills. Additionally, considering that technical English students rank as adults in terms of age and will soon seek employment in technical communities, the categories to reflect upon also overlap with what employers are looking for in potential employees. Thus, while improving their learning styles, students also get a glimpse into what their working styles are and learn how to improve them as well.

When filling in the self-observation chart, students are advised to consider their ESP class specific behavior rather than their overall performance in the role of students in other related or unrelated classes. Additionally, students are encouraged to analyse their own performance from an outside stance, thus providing an objective perspective on the way in which they operate in class. The categories of interest in this observation chart build gradually from passive learning into active learning, encouraging students to actively reflect on their personal learning styles and on the quality of the learning outcome, while receiving suggestions of what ideally makes them better learners. The suggested categories involve **task completion/work habits**, **use of information, class participation, cooperation with others, goal setting, initiative, independent work, problem solving**. Each category has been approached from the angle of Passive and Active learning, thus allowing students to reflect on the importance of each type of learning, particularly since passive learning strategies set the background for active participation and learning autonomy. Moreover, in the case of dominantly inactive students, it may raise awareness of what they should do next with the information they receive passively as outlined in the chart.

The self-observation chart has been devised for use as follows: each student reads through the categories and ticks the aspects they consider are true for them, after which they reflect on the ones they have not ticked. The next step is to think of why they have not undertaken those actions in the past and how undertaking those in the future

might benefit their learning. Students should also be encouraged to reflect on how they might incorporate the sections they have not ticked into future performance in class.

Self-observation chart

An analysis of learning and working styles during Technical English Classes
Instructions: a) Think of yourself in the role of a student. b) Tick the bullets containing information that you consider to be true for you as a student at present. c) Reflect on the categories you have not ticked. Why do they not represent your style of work at present? How could they benefit you if they were true? In what ways can they be made true for you?
Example I have not ticked °*is attentive to details*. It is because I often rush to get things done. If I paid attention to details, my work would be more qualitative. Also, I would spend less time correcting mistakes resulting from rushed work. I should probably tone down my tempo and work more thoroughly.

1. Task completion /work habits

Passive learning	Active learning
o attends regularly and displays punctuality o is attentive to details o understands directions, task instructions o organizes materials and equipment for effective use o chooses and uses materials, technology and equipment correctly, safely o organizes and uses time efficiently (uses planners, schedules, breaks work into manageable sequences)	o completes assignments based on instructions with punctuality and care o begins work promptly (without procrastination) o perseveres with complex projects that require sustained effort o is flexible and adaptable during class o is interested and enthusiastic about homework assignments o manifests creativity in task resolution

2. Use of information

Passive learning	Active learning
o understands, summarises information o gathers information effectively, using a variety of techniques and resources o understands visuals (diagram, schemata, tables, charts) o is interested in the accuracy of the information provided o organizes information logically and manages it effectively o selects appropriate research procedures and uses them effectively o recognizes when assignments and projects	o interprets information and identifies relevance (in what other ways it can be used) o invests consistent effort in interpreting visual material, tries to make sense of it and formulate relevance o analyses all information and alternatives in reaching a conclusion o asks questions to clarify meaning and ensure understanding

would benefit from additional information and identifies the type of information needed o uses information-retrieval technology effectively	o assesses information and ideas and draws relevant conclusions o integrates learning from various other subjects / areas of learning o uses data creatively, recycles concepts, knowledge and applies it to other tasks

3. Class participation

Passive learning	Active learning
o actively listens to ideas mentioned during class, group activities o accepts various roles within the class and group, including leadership and menial roles o takes on work to be done to complete class and group activities or projects o accepts the goals of the class and group, rather than one's individual goals o manifests respect for the ideas of others in the class and group o recognizes contributions of group members through encouragement, support, or praise o accepts responsibility for personal behavior/reactions	o Actively participates in class and group activities o manifests interest in working with new groups o actively contributes to cooperative problem solving o tries to motivate others and encourages others to participate o communicates well with class and group members o contributes information and ideas to the class and group o questions the ideas of the group to seek clarification or agreement o supports ideas and observations of the group with facts and details o paraphrases points of view to help understanding o seeks consensus before making decisions o works to resolve difficulties encountered during an activity o carries out decisions.

4. Cooperation with peers

Passive learning	Active learning
o follows classroom procedures o listens to, acknowledges differing opinions o respects the rights, property, and opinions of others o shares resources, materials, and equipment with others o responds to and is sensitive to the needs and welfare of others	o willingly engages in working with others o assumes responsibilities in groups, the classroom, and the school o helps others, takes turns, volunteers o takes into consideration the immediate and long-term effects of their actions on others o engages in cooperative work and social interaction with others o establishes positive relationships with peers

	o takes into consideration differing opinions

5. Goal setting

Passive learning	Active learning
o Identifies personal and group goals o sets appropriate criteria for assessing work o identifies specific steps or actions needed to reach goals or to improve o identifies strengths and areas for improvement in own work o revises goals or steps and strategies when necessary o accepts comments on performance from others and carefully weighs them	o uses identified criteria to assess work o assesses one's own work o evaluates own success in reaching goals o perseveres to achieve goals o identifies and pursues goals independently o uses peer review to improve work and monitor learning

6. Initiative

Passive learning	Active learning
o accepts new tasks o wants to learn more o manifests curiosity about phenomena, objects and events o identifies problems to solve o approaches new learning situations with confidence	o seeks new opportunities for learning o generates questions to deepen understanding o takes on challenges, responds to challenges and takes risks o observes, questions, and explores o initiates search of new information in additional resources, investigates and obtains information independently o is not afraid to conduct experiments o develops original ideas and innovative procedures o seeks assistance when necessary o attends co-curricular activities

7. Independent work

Passive learning	Active learning
o accepts and understands working protocols/ routines o uses planners to organize time effectively	o works efficiently without supervision o persists with challenging tasks o deploys working protocols/ routines without supervision o identifies and pursues learning goals and tasks independently o selects learning materials, resources, and activities independently o explores, selects, and uses a variety of learning strategies

8. Problem solving

Passive learning	Active learning
o approaches problems using logic o chooses appropriate materials and equipment to solve problems o analyses previous solutions to similar problems o makes associations between various domains of knowledge in solving problems	o uses analysis to clarify problems o devises a plan to solve the problem and carries out the plan o records the process and the results o checks the solutions / results o evaluates the plan, solution, or result o solves problems independently o devises alternative solutions or ways of solving a problem o applies successful strategies to new problems o develops original ideas and creative approaches to solve problems

5. Conclusion

At the very core of professional success in the current society stands the ability to learn. With increasingly rapid changes in the work place dynamics, parly due to the rapid growth of technology and as a result of changing societal needs in a new and globalised world, students are faced with the need learn how to learn so that they are able to enter and maintain their participation on the employment stage and in civil society. The need for becoming competitive in the work environment starts with becoming self-competitive and develop one's professional persona during academic years. Post-communist education has been moving in the direction of building structures for self-development that students can rely on in their subsequent professional lives. In other words, educators are becoming aware and are raising awareness in their students of the necessity for continual development that is able to aid any individual in transcending from academia to the labour market. The limited perpective of an educator faced with the challenge of activating students during Technical english classes has been captured in the form of the current study, relying on the reflection of daily challenges posed by students who prefer to remain passive and hope that the knowledge acquired will suffice them in becoming active workers one day. Therefore, the goal of the current paper has been to identify the components of learning and how they can be converted into skill, along with raising the awareness of what students are actually engaging in during learning and how they could further develop active participation. During techical English classes, students often find themselves intimidated by the apparent difficulty of the subject. The self-observation chart constructed above is aimed at increasing students' metacognition and providing them with aid as to how they can further their understanding of technical terminology and concepts with the tools of curiosity, further research, problem-solving, initiative and group collaboration.

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