

BLOOM'S MASTER LEARNING MODEL: A CASE STUDY EXAMPLE OF APPLICATION IN THE TVET

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Abstract: The article examines the theoretical concept on which Bloom's Master y Learning rests, as well as certain of its characteristics that are still relevant and appropriate today. Research on the relationship between Mastery Learning and achievement for students as well as the impact on positive levels of motivation and attitudes towards learning is reviewed and summarized. With its consilient characteristic including competency-based curriculum design, preliminary assessment, flexible learning paths and educational divergence, as well as self-study formative assessment and assessment of mastery, the proposed model could fit in vocational education and training courses. A generalized example of the application of elements of Mastery Learning in electrical engineering classes is proposed: some guidelines for the stages of Mastery Learning are indicated, and examples of Mastery Learning modules are given. In the article is disclosed in detail a case example of applications such a model with all the predicaments and ensuing endeavoring challenges in the field of electrical science. It is revealed the expected positive results and the appropriateness of the developing of such model. Clearly the Master learning is not a nostrum or elusive remedy for the variety of problems in the vocational education but it could contribute to some benefits like building confidence, improving technical skills, development early identification of needs, "Stronger Foundations", personal excogitation and ratiocination. Mastery learning as a model can contribute to the effectiveness of learning in VET with its flexible design of a curriculum based on competencies where each is divided into smaller, measurable learning objectives; with a mastery assessment that requires students to demonstrate mastery of each competency before moving on to the next level involving hands-on assessments, simulations, or real-world projects where they demonstrate their skills; with self-paced learning offering online modules, instructional videos and hands-on exercises that allow students to learn at their own pace. The core structure of Master learning applied in VET is based on the backward design with the three stages: identifying desired results, determination of acceptable evidence and planning learning experiences and instructions with creating cyclical patterns of learning instead of linear patterns. Each cycle starts with clear objectives, planning a mastery rubric, planning the assessment and finishes lastly with lesson planning. This could be achieved with an established space effective learning where students solve problems in collaboration groups discussing and debating issues from real life doing practical hands-on activities searching and resuming piles of information on a particular from different sources and the internet.

Keywords: Mastery Learning, Vocational Education, competence.

1. INTRODUCTION. THEORETICAL BASIS FOR MASTERY LEARNING

The basic conception model of Mastery Learning (ML) was defined and exposed by Benjamin Bloom in 1968 and published in research paper Learning for mastery. Historically in different didactic schools he had supporters (Guskey, 2010; Hunter, 1982; Meece et al., 2006) and critics (Anderson & Burns, 1987; Arlin & Webster, 1983; Slavin, 1987, 1989), but managed to endure the test of time and solidified as a "successful model for mastery learning". (Guskey, 2010; McGaghie, 2015; Nolan, 2016).

A significant number of researchers have investigated the relationship between mastery learning (ML) and student achievement, and there is strong evidence to suggest that implementing ML in the classroom not only aggregate and rise knowledge and skills but can also emphatically influence students' motivation levels and attitudes toward educational processes (Adeyemo & Babajide, 2014; Guskey & Anderman, 2017; Madjar & Chohat, 2017).

As a fundamental basis for MO is the theory of goal orientation (goal orientation theory) emphasizes the idea that students' experiences in the school ambience are related to the type of orientations they have adopted, and these orientations reflect on a positive shift of their views of school and the processes there (Dweck, 1986; Kaplan & Maehr, 2007). For that reason, Bloom created a framework with two strategies. The first was connected with the knowledge and the idea that teaching and learning situations could be excellent if the tutor is paired with the individual student. In other words, Bloom tries to determine what critical elements in one-to-one tutoring might be transferred to group based instructional setting. The second strategy was the proper identification of the activities of high achieving students in group-based environments that distinguish them from their less successful counterparts.

Another set of strategies in mastery learning relate to the **mastery goal orientations** (MGO) which more precisely means **mastery-approach goal orientations**. The basic concept here is achievement and realization of master goal orientation with a focus on learning and evolving competences and enlarging the view of the students'

understanding of concept and expertise. "More generally, mastery goal orientation refers to a personal development and growth goal that guides achievement-related behavior and task engagement" (*Kaplan & Maehr, 2007:142*). Several research proved a direct relationship between this type of orientation and successful results in the school. (*Meece et al., 2006*). Such results are (*Dweck, 1986; Kaplan & Maehr, 2007; Wolters, 2004*):

- ✓ positive problem solving strategies,
- ✓ persistence,
- ✓ transfer of problem solving strategies,
- ✓ positive social attitudes and task coping.

Emery et al. (2018 :419) describe, "...classes with mastery-oriented goals, the goal drives them motivated to improve their competencies and master skills." Students who identify with a MGO will often have attitudes for growth and would apprehend each skill as an achievable quality being evolved through hard work and persistence (*Dweck, 1986*). Some students with MGO go to the other extremity, a variation of MGO, which we must avoid, it is the so-called "mastery-avoidance orientation". It is characterized by a student motivation to perform the school tasks just for the reason to avoid failure to learn. (*Wolters, 2004*). It means that these students are not attracted of developing new skills and knowledge understanding its positive effect in education, but rather they advance in their studies lead by the concern of unacceptable an unsatisfactory effect of lacking skill and knowledge which are absolutely necessary to life that are proposed to be acquired during the school hours.

And the last type of goal orientation, defined by Bloom, is the performance goal orientation (or performance-approach go orientation). Students who adopt this type of orientation focus on demonstrating their abilities to others as well as managing the impressions they make on those around them. This is also connected with specific soft skills of leadership in particular students who want to demonstrate their abilities and to control, command and sometimes even manipulate the impressions on the other students. Often it is translated into a leading motivator for their learning, but such students may be more likely to cheat, exhibit trichery and tricks on assignment as well as having destructive and harmful discipline while participating and collaborating in class (*Meece et al., 2006, Senko et al., 2011*).

Summarizing the resumptive picture of the core ideas of mastery learning are proper setting and evolving motivations strategies in class as well as corrective personal knowledge and skill enrichment of each student or a group. Master learning could be highly effective with less implication when instruction focuses on high-level outcomes such as problem-solving, drawing inferences, deductive reasoning and creative expression.

Applied model of o develop task-centered hands-on STEM learning of educational robotics is proposed by *Chang et.al (2020)*; model of gamification in medical anatomy learning (*Berger et al, 2022*), ML in a gamified intelligent tutoring system (*Hou et al., 2022*); model of "Simulation-based mastery learning (SBML)" providing better outcomes as a strategy in Physical Medicine and Rehabilitation (*Kivlehan et al., 2023*).

Amurao & Ilagan (2021) developed a ML model for completely pure online learning environment, and *Zare (2023)* examined the the effect of ML method on the academic performance.

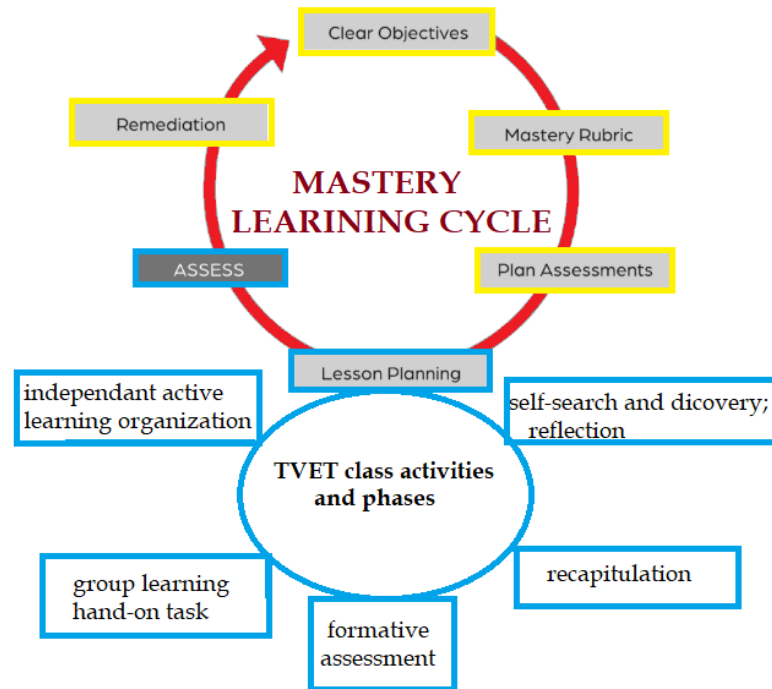
2.CHARACTERISTICS OF THE MASTER LEARNING

Specifically, Bloom and his colleagues designed a course plan so that it was broken down into smaller units of one to two weeks. Then, at the end of each module, students would be assessed formatively and that would either prove that students have gained the putative skills and know the content so far, or exists misunderstandings and misconception with different volume and strength.

Formative assessments can consist of a variety of forms, such as tests, oral presentations, and performances. If learning gaps are identified, students must be provided new ways of learning the content and before proceeding next course or module. (*Bloom, 1968; Guskey, 2007*).

Bloom first tested his MO methodology in a Theory of Evaluation course. By parallel achievement tests, "20% of students scored a "6" in the course in 1965, and 80% scored a "6" in 1966". This lead to additional measurement and arrangements, and consequently by 1967, 90% of students in the same course and using the same achievement test had scores of "6" (*Bloom, 1968: 11*). In **Fig.1** is shows resumed the core ideas of the proposed Mastery learing applied in TVET classes in condruence with Bloom's theory.

Fig.1. Mastery Learning Cycle with TVET class phases.



Source: *author's research.*

Table 1. Summary Mastery Learning includes:

Competency-based curriculum design	Designing the curriculum around specific competencies or skills that students need to master. Break each competency down into smaller, measurable learning objectives
Preliminary assessment	Before starting a module, a pre-assessment is required to identify students' existing knowledge and skills. This will help to personalize learning pathways and identify areas where they need extra support.
Flexible learning paths	Offering multiple learning paths based on student pre-assessment results.
Self-study	Providing resources such as online modules, instructional videos, and hands-on exercises that allow students to learn at their own pace.
Formative assessment	Implement regular formative assessments throughout the learning process to assess student progress and provide feedback
Assessment of mastery	Students are required to demonstrate mastery of each competency before moving to the next level. Most notably practical assessments, simulations or real-world projects where students demonstrate their skills.

Source: *author's research.*

3. CASE STUDY: EXAMPLE OF MASTER TRAINING IN THE SUBJECT “ELECTRICAL CIRCUITS AND ELECTRONICS” IN VOCATIONAL EDUCATION.

A. TVET Model steps:

Mastery as a model and educational approach where students must demonstrate mastery of a subject before moving on is particularly effective in vocational education and training (VET) where practical skills and competence are critical.

Mastery training can be a valuable tool, as all grade 10 and 11 electrical content such as general and branch theory training can be broken down into micro-modules with specific unit activities equivalent to real-life electrical engineering activities. The whole concept of the Ministry of Electrical Engineering can be summarized as follows:

Breaking down electrical concepts into "learnable, complete volumes" :

- ✓ Modular learning: the electrical engineering subject is divided into smaller, manageable modules focused on specific skills (Ex: such as circuit analysis , identification and specification of electrical components , use of a multimeter and basic wiring techniques , repair work...)
- ✓ Pre-assessment and formative assessment:
 - Pre-assessment: Before each module, a diagnostic assessment is conducted to assess students ' prior knowledge . This may include written tests, practical exercises or prompts for self-reflection.
 - Formative assessments: In each module, the inclusion of frequent checks on the degree of assimilation and understanding of knowledge . They may include tests focused on key concepts, hands-on exercises with feedback from peers , other professionals , or troubleshooting simulations.

Stages of Mastery Training:

- ✓ Instruction: Uses a variety of teaching methods such as lectures, demonstrations, laboratory exercises , and visual aids to explain electrical principles and demonstrate safe practices.
- ✓ Practice: Providing students with opportunities to practice the skills learned through hands-on activities , example: drawing up and building electrical circuits, troubleshooting simulated failures in them, or performing practical exercises on electrical equipment.
- ✓ Formative assessment: each training session has formative assessments to ensure understanding by the MO and student self-reflection . Providing feedback and identifying areas that need improvement.
- ✓ Mastery: Students who demonstrate mastery can move on to the next module or engage in enrichment activities such as learning more advanced circuits or designing their own electrical projects.
- ✓ Recovery: Students who struggle receive additional support such as small group tutoring, one-on-one practice sessions, or online resources.

B. Examples of modules on electrical engineering for 9th and 10th grades (a case in Bulgarian TVET):

- ✓ Assessment of laws and principles in electrical engineering :
Theoretical introduction to Ohm's law, Kirchhoff's laws, as well as some fundamental principles of electromagnetism, Faraday's law, Lenz's rule. An extremely theoretical module, but to overcome it, it is necessary to constantly refer to real examples from practice, as well as to devices operating on the basis of these principles
- ✓ Circuit Basics:
Building circuits or electronic modules, focusing on components such as resistors, capacitors, and inductors. Pre- assessment of prior knowledge, instruction through demonstrations and visual materials, provides a hands- on demonstration in building circuits on breadboards as well as enrichment activities such as circuit simulations in an electronic environment.
- ✓ Using measuring equipment and a multimeter:
A given module / layout for measurement and working with a multimeter. Assess prior knowledge of ZBUT, demonstrate it to practical exercises for measuring voltage, current and resistance, so that advanced students can explore and improve additional functionalities of a multimeter and other measuring equipment - an oscilloscope.
- ✓ Basic wiring and soldering techniques:
Training in safe wiring practices and regulations through demonstrations, providing hands - on real work environment in building basic circuits following wiring diagrams, use formative assessments such as inspections for code compliance and functionality, offer enrichment activities such as designing and building complex circuits.
- ✓ Repair of ... (transformer, electric motor, electrical circuit for start/stop control of electric drive, etc.):
Basic approaches and steps in repair work, disassembling elements and parts, measuring, replacing a defective electrical element, etc. Basic standards in compliance with safe work.

4. BENEFITS OF MASTER TRAINING IN ELECTRICAL ENGINEERING:

- ✓ "Stronger Foundations": Students gain a thorough understanding of electrical concepts before moving on to more complex topics.
- ✓ Improved skill development: Constant practice through MO leads to mastery of basic electrical skills.
- ✓ Building Confidence: Mastery of skills promotes confidence and prepares students for career success in choosing to be an electrician .
- ✓ Early identification of needs: Formative assessments help identify and address learning gaps at an early stage.
- ✓ Differentiation: MO allows for personalized learning paths based on individual needs.

5. CHALLENGES AND CONSIDERATIONS

- ✓ Time management: Implementation of MO may require adjustments in pacing and additional time for individual support.
- ✓ Laboratory resources: MO requires access to sufficient laboratory equipment and materials for practical activities for each student .
- ✓ Teacher training: training is needed to implement MO effectively , which can be challenging for young and inexperienced teachers .

6. CONCLUSION

ML as a model can contribute to the effectiveness of learning in VET with its flexible design of a curriculum based on competencies where each is divided into smaller, measurable learning objectives and active learning tasks; with a mastery assessment that requires students to demonstrate mastery of each competency before moving on to the next level involving hands-on assessments, simulations, or real-world projects where they demonstrate their skills; with self-paced learning offering online modules, instructional videos and hands-on exercises that allow students to learn at their own pace. Mastery learning is not an educational panacea and definitely wouldn't solve all the complex problems facing educators of the digital Big Data era. But with its profound and sheer ideas could be a proficient tool in teaching and learning in vocational education, mixing with the new ideas and design, to attain results efficiently and frugally.

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