RELATIONSHIP AMONG STUDENTS' LEARNING STYLE, ASSESSMENT OF LEARNING OUTCOMES AND STUDENTS' PERFORMANCES

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Abstract

Learning Outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably be demonstrated at the end of a course or a program. In other words, learning outcomes identify what a learner will know and will be able to do by the end of a course or a program.

Assessment is a systematic process of looking at student achievements within and across courses by gathering, interpreting and using information about student learning for educational improvement

Curriculum is a planned educational experience in a given discipline implemented within a specified time period to foster the desired academic & professional development of learners in that discipline.

Our main objective is to train quality specialists capable to meet the national/international requirements. This paper extensively discusses the importance of assessment, learning outcomes, students' learning styles and the relationship between Students' Learning Style and the assessment of Student Learning Outcomes.

The survey outcomes depict that the identification of Students' Learning Style is very important during early stage of a module as it is greatly helpful to prepare assessments and teaching methods which can be used in delivering the module. Students with different learning styles perform differently during assessments in practical and theoretical classes. Most of the lecturers do their best to finish the module according to the given time period. But the important thing is how students achieve the learning outcomes of the particular module. By considering these aspects, it is clear that there is a close relationship among Students' Learning Style, Assessment of Student Learning Outcomes and Students' Performances.

Keywords

Assessments, Learning Outcomes, Learning Styles, Curriculum

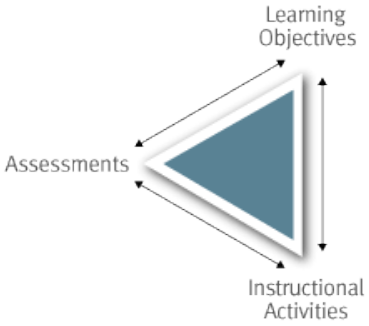
1.0 Introduction

A study has been conducted to observe which learning style (Auditory, Visual and Tactile) would be better under two types of assessments such as Theory or Practice.

According to the Nelson Mandela *"Education is the most powerful weapon which you can use to change the world",* unfortunately most of lecturers use assessment as the weapon. Therefore, most students fear to face the assessments. Hence, as lecturers we have a duty to change students' mindset and we have to make them aware that assessments are not used to penalize anyone, they are used as a tool/indicator to improve student learning by introducing new assessment methodologies to improving learning quality and student performances.

Assessment is claimed to be the 'life-blood' of learning and by assessing we make inferences about our students' current and future performance *(Fardon, 2013).* The investigation considers the effect of identifying learners' perceived abilities, in relation to their visual, auditory and kinesthetic learning styles, in order to help guide and develop them and their tutors to maximize their abilities and desires.

Assessments should reveal how well students have learned what we want them to learn while instruction ensures that they learn it (Eberly Centre, Teaching Excellence & Educational Innovation, 2015). For this to occur, assessments, learning objectives, and instructional strategies need to be closely aligned so that they reinforce one another.



In order to ensure that these three components of your course are aligned, ask yourself the following questions:

- **Learning objectives:** What do I want students to know how to do when they complete this course?
- **Assessments:** What kinds of tasks will reveal whether students have achieved the learning objectives I have identified?
- **Instructional strategies:** What kinds of activities in and out of class will reinforce my learning objectives and prepare students for assessments?

If assessments are misaligned with learning objectives or instructional strategies, it can undermine both student motivation and learning. Consider these two scenarios: Your objective set for students is to learn how to *apply analytical skills*, but your assessment measures only *factual recall*. Consequently, students hone their analytical skills and are frustrated that the exam does not measure what they learned.

Assessment measures students' ability to *compare and critique* the arguments of different authors, but your instructional strategies focus entirely on *summarizing* the arguments of different authors. Consequently, students do not learn or practice the skills of comparison and evaluation that will be assessed.

Table 1 presents examples of the kinds of activities that can be used to assess different types of learning objectives (adapted from the revised Bloom's Taxonomy).

Learning takes place in students' heads where it is invisible to others. This means that learning must be assessed through performance: what students can do with their learning. Assessing students' performance can involve assessments that are formal or informal, high- or low-stakes, anonymous or public, individual or collective.

Here we provide suggestions and strategies for assessing student learning and performance as well as ways to clarify your expectations and performance criteria to students.

- Creating assignments
- Creating exams
- Using classroom assessment techniques
- Using concept maps
- Using concept tests
- Assessing group work
- Creating and using rubrics

Assessment and grading are not the same. Generally, the goal of *grading* is to evaluate individual students' learning and performance. Although grades are sometimes treated as a proxy for student learning, they are not always a reliable measure. Moreover, they may incorporate criteria – such as attendance, participation, and effort – that are not direct measures of learning.

The goal of *assessment* is to improve student learning. Although grading can play a role in assessment, assessment also involves many ungraded measures of student learning. Moreover, assessment goes beyond grading by systematically examining patterns of student learning across courses and programs and using this information to improve educational practices.

During any assessments, simply checking how students have achieved the learning outcomes as a result of a particular module/course. Students' grades are varied from student to student

at the assessments based on how they achieved the same learning outcomes. There are four (4) levels of thinking about learning and teaching.

1. What a student is?
2. What a teacher does?
3. What a student does?
4. How a student manages?

When we try to find answers to What a student is? question or What a student does?, students' learning style provides the answer for both questions. My personal idea is when we conduct assessments, not only concentrate to the Learning Outcomes, but also consider the Students' learning style.

Table 1 - Types of activities that can be used to assess different types of learning objectives

Type of learning objective	Examples of appropriate assessments
Recall **Recognize** **Identify**	Objective test items such as fill-in-the-blank, matching, labeling, or multiple-choice questions that require students to: • recall or recognize terms, facts, and concepts
Interpret **Exemplify** **Classify** **Summarize** **Infer** **Compare** **Explain**	Activities such as papers, exams, problem sets, class discussions, or concept maps that require students to: • summarize readings, films, or speeches • compare and contrast two or more theories, events, or processes • classify or categorize cases, elements, or events using established criteria • paraphrase documents or speeches • find or identify examples or illustrations of a concept or principle
Apply **Execute** **Implement**	Activities such as problem sets, performances, labs, prototyping, or simulations that require students to: • use procedures to solve or complete familiar or unfamiliar tasks • determine which procedure(s) are most appropriate for a given task
Analyze **Differentiate** **Organize** **Attribute**	Activities such as case studies, critiques, labs, papers, projects, debates, or concept maps that require students to: • discriminate or select relevant and irrelevant parts • determine how elements function together • determine bias, values, or underlying intent in presented material
Evaluate **Check** **Critique** **Assess**	Activities such as journals, diaries, critiques, problem sets, product reviews, or studies that require students to: • test, monitor, judge, or critique readings, performances, or products against established criteria or standards
Create **Generate** **Plan** **Produce** **Design**	Activities such as research projects, musical compositions, performances, essays, business plans, website designs, or set designs that require students to: • make, build, design or generate something new

2.0 Literature review

Learning outcomes describe what students are able to demonstrate in terms of knowledge, skills, and values upon completion of a course, a span of several courses, or a program (Tiu). Clear articulation of learning outcomes serves as the foundation for evaluating the effectiveness of the teaching and learning process.

The Components of a Measurable Learning Outcome. Three essential components of a measurable learning outcome are:

- Student learning behaviors
- Appropriate assessment methods
- Specific student performance criteria / criteria for success

Formative assessment is an assessment that determines how much students already know, and if they possess mastery of the content matter. Examples of formative assessments might be a *pre-test, rough draft, quizzes, homework, rough drafts of papers, or answering questions in class.*

Information gathered from these assignments will provide insights as to how much students already know, and how well they can articulate what they know. ***Formative assessments help instructors learn what needs to be taught.***

Summative assessments are intended to *determine how much, and to what extent, students have learned and mastered the content.* Summative assessments include final projects (be sure to use rubrics), final exam, final test over a unit of learning, portfolio, or final paper.

Summative assessment scores/ grades also help to provide information about the effectiveness of the curriculum, and the extent to which the curriculum is aligned with instruction and assessment. Wise instructors pay attention to summative assessments and make instructional adjustments during the teaching/ learning process.

Further, the assessment should be changed based on the majority learner type of the class.

Understanding Learning Styles

What do you know about learning styles? How can you use knowledge about learning styles in your teaching?

Visual: learning by seeing visual images.

Visual learners learn best when information is presented in a written language format or in another visual format such as pictures or diagrams. If you are a visual learner, the suggestions that follow can help you to succeed at school to the best of your ability.

- Create graphic organizers such as diagrams and concept maps that use visual symbols to represent ideas and information.
- When trying to remember information, close your eyes and visualize the information.
- Include illustrations as you take notes in class.
- Use highlighter pens of contrasting colors to color code different aspects of the information in your textbooks.
- Sit at the front so that you can clearly see the teacher. This will allow you to pick up facial expressions and body language that provide cues of what your teacher is saying is important to write in your notes.
- Study in a place that is free from visual distractions.
- When using flashcards, limit the amount of information on a card so that you can form a mental picture of the information.
- Watch videos about topics you are studying in class.
- When encounting a new word you want to remember, visualize its spelling.
- When reviewing information, rewrite or draw the information from memory.
- When taking notes, replace words with symbols wherever possible.
- Type your written notes from class using different fonts, bold print, and underlining to make the most important concepts and facts visually apparent.
- When solving math problems that involve a sequence of steps, draw a series of boxes, each containing the appropriate piece of information in a sequence.

Auditory: learning by listening or by speaking.

Auditory learners learn best when information is presented in a spoken language format. If you are an auditory learner, the suggestions that follow can help you to succeed in school to the best of your ability.

- Participate in study groups in which you can talk things out.
- If allowed by your teacher, use a recording device to record class sessions. Use the recordings to support your written notes.
- Use a recording device to record the important information from your textbooks so that you can listen to the information as frequently as needed.
- Work out math problems aloud, explaining to yourself the steps you are doing.

- Repeat facts and definitions of words over and over to yourself with your eyes closed.
- Create musical jingles or songs to remember information.
- Dictate assigned papers and type them later.
- Participate in class discussions as much as possible.
- Look for books on tape or other audio materials when learning about a subject.
- Be certain that your study place is free from auditory distractions.
- When you encounter new words while reading, pronounce them syllable by syllable.
- Sit in front of the class to minimize things that might distract you from what your teacher is saying.
- Read aloud when doing proofreading.

Bodily-Kinesthetic: learning by using bodily movements such as doodling, outlining, or actively taking notes.

Bodily-kinesthetic learners are those who have to be actively involved by doing something that requires physical engagement. These learners need to be actively involved. During lectures these are the ones who are busy writing and taking notes. Instructors should plan some time during the class period for students to work in groups, go to the library to accomplish a specific, time-oriented task, be given class time to work on an individual project, etc.

Good instructors find a way to incorporate all of these into a given class period, so that each learning style can benefit.

If you are a tactile/kinesthetic learner, the suggestions that follow can help you to succeed at school to the best of your ability.

- Be physically active while you study. Rather than just sit at your desk, occasionally walk back and forth with your textbook or notes as you read the information out loud.
- To decrease your fidgeting as you study, listen to music, preferably baroque music. However, discontinue this if you find the music to be distracting.
- Make extensive use of a computer and the Internet. Actively touching the keyboard will keep your mind active.
- Take extensive written notes in class. Edit and type them later.
- Study in short blocks of time with frequent but short breaks.
- Do something physical as you study such as tapping a pencil or squeezing a stress ball.
- Use your finger as a guide while reading.
- Act out things you have to learn whenever possible.
- Construct models of things you have to learn whenever possible.
- If you find it difficult to sit at a desk when studying, trying lying on your stomach or back.
- When trying to remember information, close your eyes and "write" the information in the air. Picture the information in your mind as you do so.
- Use concrete objects to help you understand math concepts.
- When trying to learn the spelling of a difficult word, arrange letter blocks to spell the word.

3.0 Methodology

Primary data is collected through a questionnaire survey and secondary data collected from existing information on Student Marks in different assessment during Semester II at "Database Management Module". Questionnaire (Attached in Annex 2) has been prepared and distributed among undergraduates' students of the faculty of IT at their 1st lecture of the "Database Management" module to identify the learning style of the group. Survey outcomes are shown in table 2.

Based on the outcome of the survey the researcher/lecturer of the module has been used different teaching methods of delivering the lecture such as presentation, group presentations, discussions, practical demonstrations, hands-on practical session etc.

The researcher selected Database Management module (Detailed course outline is attached in Annex 1) which has theory and practical component to monitor same student sample's marks in different assessments. Quizzes, Mid-term (Theory & Practical) and End-term (Theory & Practical) are the main assessment methods conduct in the module.

Table 2 – Student Distribution with Different Learning Styles

Learning Style	Number of Students
Visual	01
Auditory	01
Kinesthetic	05
Visual/ Kinesthetic	07
Auditory/ Kinesthetic	05
Visual/Auditory	10

Table 3 illustrates the learning outcome of the 'Database Management' module and which type(s) of assessment are given to evaluate student performance/learning quality.

Table 3 - Learning Outcome of the 'Database Management' module and Different Assessments Methods Conducted

Learning Outcomes of the Database Management Module	Different type of Assessments methods conduct				
	Quizzes	Midterm		End term	
		Theory	Practical	Theory	Practical
1. Describe various logical database architectures	✓	✓	-	-	-
2. Design and develop relational databases using ER diagrams	-	-	✓	-	-
3. Normalize relational database tables and apply integrity constraints	✓	-	-	✓	-
4. Manipulate data and prepare forms and reports using SQL	-	-	✓	-	✓
5. Use SQL to insert data into the database, update existing data, delete records from tables, and retrieve information from a database	-	-	✓	-	✓
6. Use integrity constrains to maintain database integrity	✓	-	-	✓	-
7. Backup and restore databases	✓	-	-	✓	-

4.0 Analysis

When we consider on Table 2, there are 18 students having Visual Learning Style, 16 and 17 students are Auditory and Kinesthetic Learning Styles respectively. According to the information on Table 4 clearly shows that Kinesthetic Learning Styles Students performed better at the Practical Assessments (Both Mid and End-term) and Visual & Auditory Learning Style Students performed better at the Theory Assessments in Database Management Module.

Table 4 illustrates the learner styles of the sample of undergraduates and marks for different types of assessments conducted in "Database Management Course"

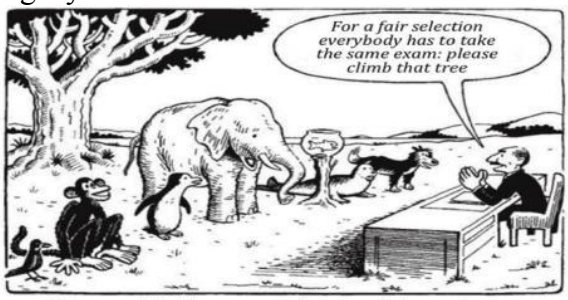
Table 4 – Assessments' Marks for Database Management Module and Students' Learning Style

Identification Number	Learning Style	Assessments' Marks [%]			
		Mid Marks		Final	
		Theory	Practical	Theory	Practical
N1	Visual/Kinesthetic	45	78	44	70
N2	Visual/Kinesthetic	68	94	63	75
N3	Auditory/Kinesthetic	54	94	63	84
N4	Visual	65	39	69	48
N5	Kinesthetic	60	100	58	78
N6	Visual/Auditory	49	60	51	65
N7	Visual/Auditory	80	65	70	50
N8	Visual/Kinesthetic	68	100	72	85
N8	Auditory/Kinesthetic	83	93	97	83
N9	Auditory/Kinesthetic	67	67	70	75

N10	**Kinesthetic**	**70**	**79**	**63**	**80**
N11	**Visual/Auditory**	**68**	**53**	**60**	**50**
N12	**Visual/Auditory**	**60**	**56**	**78**	**62**
N13	**Auditory/Kinesthetic**	**18**	**50**	**48**	**66**
N14	**Visual/Kinesthetic**	**72**	**72**	**79**	**89**
N15	**Visual/Auditory**	**40**	**53**	**60**	**60**
N16	**Visual/ Kinesthetic**	**61**	**66**	**75**	**80**
N17	**Visual/Auditory**	**18**	**47**	**53**	**69**
N18	**Visual/Kinesthetic**	**70**	**76**	**80**	**84**
N19	**Visual/Auditory**	**13**	**33**	**50**	**38**
N20	**Auditory**	**25**	**51**	**59**	**45**
N21	**Kinesthetic**	**62**	**82**	**60**	**81**
N22	**Visual/Kinesthetic**	**42**	**45**	**70**	**72**
N23	**Auditory/Kinesthetic**	**50**	**66**	**60**	**74**
N24	**Kinesthetic**	**64**	**73**	**69**	**85**
N25	**Visual/Auditory**	**55**	**67**	**60**	**55**
N26	**Visual/Auditory**	**49**	**64**	**60**	**55**
N27	**Visual/Auditory**	**42**	**32**	**55**	**35**
N28	**Kinesthetic**	**41**	**55**	**45**	**68**

5.0 Conclusion

Students selected were having different learning styles. The Database Management module has different methods of teaching and learning (lectures, case studies and practical classes), assessment methods such as continuous assessments and end semester examinations. When we measure learning outcomes of a module we can use different assessment methods. But at the same time we have to consider students' learning style.



Survey outcomes depicted that there is a close relationship among Students' Learning Style, Assessment of Student Learning Outcomes and Students' Performances. Hence, when preparing assessments we have to think not only about learning outcomes but also bear in mind students' learning styles before they undergo assessment or take exams.

Most of the Kinesthetic Learners performed well in Practical exams and Auditory/Visual Learners performed well in Theory exams in the "Database Management" module.

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