

Learning Styles among College Students

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Abstract

Learning style is the approach an individual takes when learning something new. The way people learn and process new information they are taught is one of the many factors that makes each individual person unique. This paper discussed the concept of learning styles and types, learning style models of Felder Silverman and Dunn and Dunn, learning theories of Carl Jung and David Kolb, impact of learning styles on values, and improved instruction; environmental factors affecting learners, and the educational implication of learning styles. Different learning strategies benefit learners differently. After a certain amount of practice and use, students will know how and when to use learning strategies to deal with their problems. Consequently, they will become comfortable with the idea of assuming responsibility for their learning.

1. Introduction

Learning style has been defined by various scholars mostly as a signal for individual differences. These differences may manifest it in life styles' and even in personality types. [21] described learning style as an individual preferred or habitual ways of processing and transforming knowledge. According to [21], psychological attributes resulted from individual differences determine the particular strategies a person chooses while learning. [28] defined learning style as the unique way of learning expressed in the learning process, which include observable strategies for problem solving, decision making behaviour, restrictions encountered in the learning situation and reaction under the expectations of others. [2] thought that learning style is the peculiarity expressed by learners while accepting stimulation or solving problems under learning conditions. [19] defined learning styles as characteristic cognitive, affective, and psychological behaviours that served as relatively stable indicators of how learners perceive, interact with and respond to the learning environment. Learning styles are internally based characteristics of individuals for the intake or understanding of new information [31]. All learners have individual attributes relating to their learning processes. Some people may rely heavily on visual presentation; others may prefer spoken language; still others may respond better to hands-on

activities. It is evident that people learn differently and at different paces because of their biological and psychological differences [32].

A learning style is multidimensional [20]. Its elements can be classified into five stimulus categories: environmental elements (sound, light, temperatures, and design), emotional elements (motivation, persistence, and responsibility), physical elements (perception, intake, time, and mobility), and sociological elements (self, partner, team, mentor, varied), and psychological elements (global/analytical, impulsive/reflective) [32]. [23] defined learning style as the approach an individual takes when learning something new.

The way people learn and process new information they are taught is one of the many factors that make each individual person unique. Many researchers agree that learning styles play an important role in education. For example, Felder points out those learners with a strong preference for a specific learning style may have difficulties in learning if the teaching style does not match with their learning style [14]; [16].

2. Types of Learning Styles

There are different learning styles, which students adopt in the process of learning. The three most common are: visual, auditory and kinesthetic/tactile.

2.1. Visual Learning Style

This is learning by watching. Visual learners learn best when information is presented visually and in a picture or design format in a classroom setting. Visual learners are best at understanding a wide range of information and putting it into concise, logical form. Visual learners are generally more interested in the logical soundness of an idea than its practical value. They benefit from instructors who use visual aids such as film, video, maps and charts. They also benefit from information obtained from the pictures and diagrams in textbooks. Visual learners tend to work in a quiet room and may not like to work in study groups. When trying to remember something, they can often visualize a picture of it in their mind. A visual learner could be identified by the following characteristics: mind sometimes strays during verbal activities, observe rather than acts or talks, like to read, usually a good speller, memorizes by seeing graphics or pictures,

not too distractible; finds verbal instruction difficult, has good handwriting, remembers faces, uses advanced planning doodles, quiet by nature, meticulous and neat in appearance and notices details [4]. This style combines the learning steps of Reflective Observation (RO) and Abstract Conceptualization (AC) [1]. Visual learners restrain knowledge by what they see. These types of learners should use notes that they can read and review later on. They should also make use of highlighters to colour code information, so it is more visually appealing and easier

Visual learners also retain more knowledge from the use of charts, graphs, and spread sheets than from oral lectures or other more auditory teaching aids. Computer programs and other types of visual aids can enhance their comprehension as well. Flash cards are also a great source of learning for visual style learners. Visual learners can maximize the use of flash cards, if they are responsible for creating and reviewing them. Allow visual learners an opportunity to organize materials as well so that they will have to examine information closely. Lastly, the use of acronyms, visual chains, and mnemonics is useful for a visual learner as well.

2.2. The Auditory Learning Styles

This simply means learning by hearing. Auditory learners learn best when information is presented in an oral language format. In a classroom setting, they benefit from listening to lecture and participating in group discussions. Also, they benefit from obtaining information from audiotape. When trying to remember something, they can often 'hear' the way someone told them the information, or the way they previously repeated it out loud. Auditory learners learn best when interacting with others in a listening/speaking exchange [29]. They are best at finding practical uses for ideas and theories and usually do well on conventional tests [36].

Auditory learners are also good at defining and solving problems. This style combines the experiential learning modes of abstract Conceptualization (AC) and Active Experimentation (AE) [3]. According to [25], the following are the characteristics of auditory learners: talking to oneself aloud, engage in excessive talking, easily distracted, have difficulty with written directions, like to be read to, memorizes sequentially, enjoys music, whispers to self while reading, distracted by noise, hymns or songs, and sociable. Auditory learners gain the most from what they hear. Therefore, they should be encouraged to read aloud when they must comprehend something from a book.

Auditory learners should also be encouraged to summarize orally what they have read after they have read it. Summarizing aloud will allow an auditory learner to hear the information, so they can

get a better handle on it. In addition, requiring a verbal summary will allow both you and the auditory learner to know whether they have grasped the material successfully or if whether more time may be needed for additional study. Auditory learners tend to retain information from funny little jingles that they make up or that can be taught. Jingles, songs and poems spoken aloud can help auditory learners remember dates and events of importance. Video tapes and audio tapes may also help auditory learners to gain the necessary knowledge that is required of them in a given setting. Study groups where topics can be discussed and debated aloud can also help auditory learners grasp the information they are learning.

2.3. Kinesthetic/Tactile Learning Style

This is learning by feeling. Kinesthetic/Tactile learners learn best when physically engaged in a "hands on" activity. In the classroom, they benefit from a laboratory setting where they can manipulate materials to learn new information. Also, they learn when they can be physically active in the learning environment. Kinesthetic/ tactile learners benefit from instructors who encourage in-class demonstrations, "hands on" student learning experiences, and fieldwork outside the classroom [35]. This style combines the experiential learning modes of Concrete Experience (CE) and Active Experimentation (AE). They adapt well to immediate circumstances According to [5], kinesthetic learners could be identified by the following characteristics: like physical rewards, in motion most of the time, likes to touch people when talking, taps pencil or foot when studying, enjoys doing activities, reading not a priority, poor speller, likes to solve problems by physically working through them, will try new things, outgoing by nature; expresses emotions by physical means, uses hand while talking and dresses for comfort. Tactile/kinesthetic learners retain knowledge the best when they learn through hands on activities and move around while learning. Therefore, it is more difficult for the tactile learner to retain knowledge by reading a textbook, either to themselves or aloud, that it is for other types of learners. When a tactile learner must comprehend textbook material, they should be encouraged to get up and move around the room while reading. Additionally, they can be encouraged to move their hands or tap their feet while they are otherwise sitting still. Computer usage can also help tactile or kinesthetic learners by allowing them to use their sense of touch. Tactile learners have a hard time sitting still and focusing, but concentration can be improved by allowing them to sit in the front of the classroom where there are few distractions. Comprehension can also be enhanced by allowing tactile learners to point things out as they explain

concepts, allowing them to exaggerate their lip movements, or having them learn from auditory sources that they can listen to while they move around. This type of learner can also learn concepts by putting them to beat and being allowed to tap out the best as he recites what he needs to know. Additionally, tactile learners will comprehend more if they are permitted to get up and stretch from time to time.

3. Models of Learning Styles

3.1. Felder Silverman Learning Style Model

In the following discussion the four dimensions of FLSM are described. Each learner is characterized by a specific preference for each of these dimensions. The first dimension distinguishes between an active and a reflective way of processing information. Active learners learn best by working actively with the learning material by applying the material and trying things out. Furthermore, they tend to be more interested in communication with others and prefer to learn by working in groups where they can discuss about the learned material. In contrast, reflective learners prefer to think about and reflect on the material. Regarding communication, they prefer to work alone or maybe in a small group together with one good friend.

The second dimension covers sensing versus intuitive learning. Learners who prefer a sensing learning style like to learn facts and concrete learning material. They like to solve problems with standard approaches and also tend to be more patient with details. Furthermore, sensing learners are considered as more realistic and sensible; they tend to be more practical than intuitive learners and like to relate the learned material to the real world. In contrast, intuitive learners prefer to learn abstract learning material, such as theories and their underlying meanings. They like to discover possibilities and relationships and tend to be more innovative and creative than sensing learners. The third, visual-verbal dimension differentiates learners who remember best what they have seen, e.g. pictures, diagrams and flow-charts, and learners who get more out of textual representations, regardless of the fact whether they are written or spoken.

In the fourth dimension, the learners are characterized according to their understanding. Sequential learners learn in small incremental steps and therefore have a linear learning progress. They tend to follow logical stepwise paths in finding solutions. In contrast, global learners use a holistic thinking process and learn in large leaps. They tend to absorb learning material almost randomly without seeing connections but after they have learned enough material they suddenly get the whole picture. Then they are able to solve complex problems, find

connections between different areas, and put things together in novel ways but they have difficulties in explaining how they did it. They tend to be more interested in overviews and a broad knowledge whereas sequential learners are more interested in details. The emphasis in Felder's works is on preferred learning style, not ability. He noted that: "A student's learning style profile provides an indication of probable strengths and possible tendencies or habits that might lead to difficulty in academic setting". The profile does not reflect a student's suitability or unsuitability or a particular subject, discipline or profession.

3.2. The Dunn and Dunn Learning Styles Model

An individual's learning style is determined by a combination of environmental emotional, sociological, physiological and psychological elements. The environmental elements include noise (background silence versus music or conversation), light (soft or bright lighting), temperature (cool or warm), and design (informal versus formal seating) [7]. The emotional elements include motivation (self-directed versus external), persistence, and responsible (conformity to societal norms) and structure (preference for internal or external direction). Sociological elements reflect with whom each student prefers to learn and the preferred manner in which the material is learned. Analytic learners prefer to learn alone, while global learners peer to learn in pairs, with peers, or as part of a team. The manner in which the material is learned refers to whether students learn with an authoritative adult or with a collegial individual. This element also refers to whether a student likes to learn using a variety of methods or by using established routines. Physiological elements include perceptual modalities. Some students learn better with print material (visual, with lectures (auditory), by touch (tactual) or by doing (kinesthetic). Also included are preferences for intake (shacks), time of day and mobility (moving around) while learning as opposed to sitting still. Psychological elements refer to the ways students absorb and process new information. This includes global versus analytic learning approaches. Analytic students learn easily when information is presented step by step in a cumulative sequential pattern that builds toward a conceptual understanding. Global students learn easily when they understand the concept first and then concentrate on the details, or are introduced to the information with, preferably, a humorous story replete with examples and raphics [9]. Accordingly to the Dunn and Dunn model [7], analytic and global learners have different environmental, emotional, sociological, physiological and psychological preferences. The Dunn and Dunn Learning Model

hypothesized that preferences for noise, light, design, persistence, and intake distinguish analytic learners from global learners [8]. Analytic learners learn best in a quiet, brightly lighted and formal learning environment. Global learners learn best with background noise, soft light in a relaxed learning environment. They simultaneously work on several projects, take frequent breaks, and enjoy snacks with learning.

Global learners prefer new and difficult information to be introduced anecdotally, especially in a way that humorously explains how the lessons relate to them. Hence, five of the twenty learning style elements from the PEPs survey instrument can be utilized as discriminators in order to categorize a student as an analytical learner or a global learner; preference for noise, preference for light, preference for formality of design in the location where the studying/learning takes place, preference for being persistent (avoiding interruptions while studying), and preference for food or drink intake while studying.

4. Learning Theories

Learning theories provide a pedagogical basis for understanding how students learn. It is important to recognize that "intervention" in the learning process can mean many different things. The degree of intervention, by whom, or what and how, are the defining factors of a learning theory. These factors help distinguish the many different theories such as:

4.1. Carl's Jung Learning Theory

One learning style theory is based on the work of analytical psychologist [18], who developed a theory of psychological types designed to categorize people in term of various personality patterns. Jung's theory focuses on four basic psychological functions:

- Extraversion vs. Introversion
- Sensation vs. Intuition
- Thinking vs. Feeling
- Judging vs. Perceiving

This theory later led to the development of the now-famous Myers-Briggs Type Indicator. In addition to influencing personality assessment, Jung's dimensions can also be used to assess and describe various learning styles. While each dimension represents a unique aspect of a learning style, it is most important to remember that your own individual learning style may include a combination of those dimensions. For example, the learning style might include elements of extraverted, sensing, feeling and perceiving learning styles.

4.1.1. Extraverted Learning Style. The first component of the Jungian learning style dimensions indicates how learners interact with the outside world. Extraverted learners enjoy generating energy and ideas from other people. They prefer socializing and working in groups. Learning activities that benefit extraverted learners include teaching others how to solve a problem, collaborative/group work, and problem-based learning. If you enjoy teaching others, participating in group learning by experience, you are probably an extraverted learner.

Characteristics

- Learns best through direct experiences.
- Enjoys working with others in groups.
- Willing to lead, participate and offer opinions.
- Jumps right in without guidance from others.

4.1.2. Introverted Learning Style. Introverted learners are still, sociable; they prefer to solve problems on their own. Introverted learners enjoy generating energy and ideas from internal sources, such as brainstorming, personal reflection, and theoretical exploration. These learners prefer to think about things before attempting to try a new skill.

Characteristics of Introverted Learner

- Prefers to work alone
- Enjoys quiet, solitary work
- Often generate ideas as from internal sources.
- Prefers to listen, watch and reflect
- Likes to observe others before attempting a new skill.

4.1.3. Sensing Learning Style. Sensing learners focus on aspects of the physical environment. Jung described these individuals as being interested in the external world. They tend to be realistic and practical preferring to rely on information gained through experience. While people with a sensing learning style enjoy order and routine, they also tend to be very quick to adapt to changing environments and situations.

Characteristics

- Focuses on the present
- Practical and reasonable
- Utilizes experience and common sense to solve problems
- Keenly observe the surrounding world.

4.1.4. Intuitive Learning Style. Intuitive learners tend to focus more on the world of possibility. Unlike sensing learners who are interested in the here and now, intuitive learners enjoy considering ideas, possibilities, and potential outcomes. These learners like abstract thinking daydreaming, and imagining the future.

Characteristics

- Prefers to work in short sessions, rather than finishing a task all at once.
- Enjoys new challenges, experiences and situations
- More likely to look at the big picture rather than the details.
- Like theories and abstract ideas.

4.1.5. Thinking Learning Style. Individuals with a thinking learning style tend to focus more on the structure and function of information and objects. Thinking learners utilize rationality and logic when dealing with problems and decisions. These learners often base decisions on personal ideas of right, wrong, fairness and justice.

Characteristics

- Interested in logic and patterns.
- Dislike basing decisions on emotion
- Bases decision on reason and logic.

4.1.6. Feeling Learning Style. People with a feeling learning style manage information based on the initial emotions and feelings it generates. Individuals with this learning style are interested in personal relationships, feelings, and social harmony. If you base decisions on emotions and dislike conflict, you might have a feeling learning style.

Characteristics

- Interested in people and their feelings
- In tune with their own emotions and those of other people.
- Based decisions on immediate feelings.
- Generates excitement and enthusiasm in group settings.

4.1.7. Judging Learning Style. Judging learners tend to be very decisive. In some cases, these learners may actually make decisions too quickly before learning everything they need to know about a situation. These learners prefer order and structure, which is why they tend to plan out activities and schedules very carefully. If you are highly organized, detail-oriented and have strong opinions, you might be judging learners.

Characteristics

- Do not like ambiguity or mystery
- Tend to be firm in their decisions.
- Very organized and structured
- Strong opinions
- Generally follows the rules

4.1.8. Perceiving Learning Style. Perceiving learners tend to make decisions impulsively in response to new information and changing situations. However, these learners tend to focus more on indulging their curiosity rather than making decisions. Unlike learners who tend not to change their minds, perceiving learners prefer to keep their options open. If you tend to start many projects at once (often) without finishing any of them, avoid strict schedules, and jump in to projects first without planning, you might be a perceiving learner.

Characteristics

- Often make impulsive decisions.
- Change decisions based on new information
- Dislike structure and organization
- Tends to be very flexible and adaptable.
- Sometimes has a trouble-making decision.

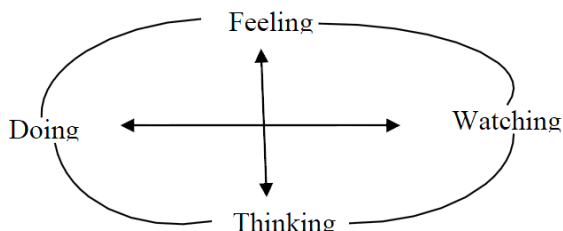
4.2. David Kolb's Learning Theory

David Kolb's learning theory works on two levels: a four stage cycle of learning and four separate learning styles. Much of Kolb's learning theory is concerned with the learners' internal cognitive processes. Kolb states that learning involves the acquisition of abstract concepts that can be applied flexibly in a range of situations. In Kolb's theory, the impetus for the development of new concepts is provided by new experiences. Kolb's experiential learning style theory is typically represented by a four stage learning cycle in which the learner touches all the bases.

1. Concrete Experience (a new experience of situation is encountered, or a reinterpretation of existing experience).
2. Reflective Observation (of the new experience of particular importance are any inconsistencies between experiences and understanding).
3. Abstract Conceptualization (reflection gives rise to a new idea, or a modification of an existing abstract concept).
4. Active Experimentation (the learner applies them to the world around them to see what results).

Kolb's learning theory sets out four distinct learning styles which are based on a four-stage learning cycle. Kolb explains that different people naturally prefer a certain single different learning

style. Various factors influence a person’s preferred style, for example, social environment, educational experience, or the basic cognitive structure of the individual. Whatever influences the choice of style, the learning style preference itself is actually the product of two pairs of variables, or two separate ‘choices’ that we make, which Kolb presented as lines of axis, each with ‘conflicting’ modes of either end.



Concrete Experience – (CE feeling) -
 Abstract Conceptualization – AC (thinking)
 Active Experimentation – AE (doing) --- V---
 Reflective Observation – RO (watching)

A typical presentation of Kolb’s two continuum is that the east-west axis is called the Processing Continuum (how we approach a task), and the north-south axis is called the Perception Continuum (our emotion response, or how we think or feel about it). Kolb believed that we cannot perform both variables on a single axis at the same time (e.g. think and feel). It is easier to see the construction of Kolb’s learning styles in terms of a two-by-two metric. Each learning style represents a combination of two preferred styles. The diagram also highlights Kolb’s terminology for the four learning styles: diverging, assimilating, converging and accommodating.

Perception Continuum	Doing (Active Experimentation– AE)	Watching (Reflective Observation - RO)
Feeling(Concrete Experience-CE)	Accommodating (CE/AE)	Accommodating (CE/AE)
Thinking (Abstract Conceptualization – AC)	Converging (AC/AE)	Assimilating (AE/RO)

4.2.1. Diverging (Feeling and Watching CE/RO). These people are able to look at things from different perspectives. They are sensitive. They prefer to watch rather than do tending to gather information and use imagination to solve problems. They are best at viewing concrete situations at several different viewpoints. Kolb called this style ‘Diverging’ because these people perform better in situations that required ideas generation, for example, brainstorming. People with a diverging learning style

have broad cultural interests and like to gather information. They are interested in people, tend to be imaginative and emotional and tend to be strong in the arts. People with the diverging style prefer to work in groups, to listen with an open mind and to receive personal feedback.

4.2.2. Assimilating (watching and thinking- AC/RO). The assimilating learning preference is for a concise, logical approach. Ideas and concepts are more important than people. These people require good clear explanation rather than practical opportunity. They excel at understanding wide-ranging information and organizing it at clear logical format. People with an assimilating learning style are less focused on people and more interested in ideas and abstract concepts. People with this style are more attracted to logically sound theories than approaches based on practical value. Assimilation is important for effective information, and science careers. In formal learning situations, people with this style prefer readings, lectures, exploring analytical models, and having time to think things through.

4.2.3. Converging (doing and thinking – AC/AE). People with a converging learning style can solve problems and will use their learning to find solutions to practical issues. They prefer technical tasks, and are less concerned with people and interpersonal aspects. People with a converging learning style are best at finding practical uses for ideas and theories. They can solve problems and make decisions by finding solutions to questions and problems. People with a converging learning style are more attracted to technical tasks and problems than social or interpersonal issues. A converging learning style enables specialist and technology abilities. People with a converging style like to experiment with new ideas, to simulate, and to work with practical applications.

4.2.4. Accommodating (doing and feeling - CE/AE). The Accommodating learning style is, ‘hands-on’, and relies on intuition rather than logic. These people use other people’s analysis, and prefer to take a practical experimental approach. They are attracted to new challenges and experiences and to carrying out plans. They commonly act on ‘gut’ instinct rather than logical analysis. People with an accommodating learning style will tend to rely on others for information, than carry out their own analysis. This learning style is prevalent.

5. Impact of Learning Styles

5.1. Impact on Learning Styles on Values

Learning style has impacted students beyond the classroom [6]. According to [10], showed some points survey respondents cited were:

1. Learning style as a dimension of diversity encourages everyone to respect and accept a variety of appropriate behaviours in the teaching and learning process.
2. Teachers become self-motivated to internally reflect on their philosophy of education as it impacts everyday interactions with students and colleagues.
3. Staff awareness is sensitized to the point that it increases self-directed autonomous learning.
4. Students accept responsibility for their learning regardless of their instructor's teaching style.
5. The concept makes the delivery of subject matter value driven and personal.
6. The concept promotes a sense of social justice and equity.
7. Knowledge of style and brain processing inevitably reduces bias.

5.2. Impact of Learning Styles on Improved Instruction

Teachers deliver content in ways that better match students' strengths. This leads to increased academic performance and improved attitudes toward school [26]. Exposure to learning style requires recognition of the need for diverse strategies designed to complement individual differences. As a result, teachers make a concerted effort to eradicate the one-size-fits all approach and acknowledge the need to modify their classrooms, instructional practices and assessments ([17; [33], [12]; [13]).

Education stakeholders recognize that these modifications are essential for academic success. Textbooks and materials are slowly changing from being essentially analytic, auditory, and visual to becoming increasingly global, kinesthetic, and tactual [17].

6. Environmental Factors Affecting Learners

Environmental factors can play an important role in all learning styles.

6.1. Bright vs. Dark

For instance, some learners, no matter what their style, learn better when it is bright while others are bothered by excessive light. Other learners regardless of their style learn better when it is extremely quiet

while noise and activity are essential for some students (anonymous).

6.2. Noisy vs. Quiet

Some learners may prefer to sit quietly, while others prefer to be allowed to move around freely. If movement is not permitted because of the risk of possible destruction, these learners can be appeased if they are allowed chew gum, squeeze a stress ball or tap their feet.

6.3. Formal vs. Informal

People also vary regarding their preference for the type of setting they learn best in. For instance, an informal setting may be preferred by some, while a formal setting is required by other. The temperature of the environment can play a role in how well someone will retain what they need to know. When someone is too hot or too cold, they simply have a more difficult time concentrating and cannot learn the material necessary.

7. Educational Implication of Learning Styles

Knowledge of one's own learning style is essential in "learning to learn" [34]. Teachers should help students discover their own learning preferences and provide constructive feedback about the advantages and disadvantages of various styles. Also, teachers should respect the learners' present preferences and encourage their development, while at the same time creating opportunities for students to experiment with different ways of learning.

Instructors may use instruments and activities specially designed for L2 learners such as [20] Classroom Work Style Survey to identify students' learning styles. Although this kind of assessment is not comprehensive, it does indicate students' preferred general learning habits. It also helps students understand their own learning styles so that they can capitalize on their strengths. As a result students can enhance their learning power by being aware of the style areas in which they feel less comfortable, and by working on their development, thus, providing avenues to foster their intellectual growth [11].

Teachers can use the survey results to identify strong style patterns in their classes, which they should consider when designing learning tasks. After identifying students' learning strengths, teachers should provide students with opportunities to learn through their modality strengths. Thus, diverse and high interest materials should be offered. These may include the creative use of video and audio materials, which may vary from heavy dependence on media

for the structure and content of the lesson to only limited use of a blackboard to illustrate concepts or grammatical rules.

Lessons may be presented both visually and verbally and reinforced through various motivating activities. In this way, students can learn in ways that best suit their styles and develop their modality strengths [24]. [30] posited that while presenting materials, teachers should provide colorful and motivating activities, personalized self-reflection tasks, some forms of cooperative learning, and powerful learning strategies to encourage self-direction in learning. Teachers should also consciously develop students' learning strategies to help students approach challenging learning tasks.

Different learning strategies benefit learners differently. After a certain amount of practice and use, students will know how and when to use learning strategies to deal with their problems. Consequently, they will become comfortable with the idea of assuming responsibility for their learning.

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6. Type-style and fonts

Wherever Times is specified, Times Roman or Times New Roman may be used. If neither is available on your word processor, please use the font closest in appearance to Times. Avoid using bit-mapped fonts if possible. True-Type 1 fonts are preferred.

7. Main text

Type your main text in 10-point Times, single-spaced. Do **not** use double-spacing. All paragraphs should be indented 1/4 inch (approximately 0.5 cm). Be sure your text is fully justified—that is, flush left and flush right. Please do not place any additional blank lines between paragraphs.

Figure and table captions should be 10-point boldface Helvetica (or a similar sans-serif font). Callouts should be 9-point non-boldface Helvetica. Initially capitalize only the first word of each figure caption and table title. Figures and tables must be numbered separately. For example: “Figure 1. Database contexts”, “Table 1. Input data”. Figure captions are to be centered *below* the figures. Table titles are to be centered *above* the tables.

8. First-order headings

For example, “1. Introduction”, should be Times 12-point boldface, initially capitalized, flush left, with one blank line before, and one blank line after. Use a period (“.”) after the heading number, not a colon.

8.1. Second-order headings

As in this heading, they should be Times 11-point boldface, initially capitalized, flush left, with one blank line before, and one after.

8.1.1. Third-order headings. Third-order headings, as in this paragraph, are discouraged. However, if you must use them, use 10-point Times, boldface, initially capitalized, flush left, preceded by one blank line, followed by a period and your text on the same line.

9. Footnotes

All references should be listed and numbered at the end of the paper in the order of their appearance. The citations should be enclosed in brackets. For example, the reference:

7. Shoniregun C. A., (2002), ‘The Future of Internet Security’, *Communication of the ACM: Ubiquity* (ACM IT Magazine and Forum), Volume 3, Issue 37, Oct 29. The latter should be cited as ‘...the future is not all rosy [7]...’. Authors should distinguish among different types of references and should follow the following examples:

- **Journal Article:** Bergel, H. (2000) ‘Predatory Disintermediation’, *Communications of the ACM* 43 (5), pp. 23-29.

- **Book (authored or edited):** McEachern, T. and O’Keefe, R. M. (1997) *Rewiring Business: Uniting Management and the Web*, John Wiley & Sons, New York.
- **Chapter in book/proceedings:** Clemons, E. K. and Row, M. C. (1998) ‘Electronic consumers interaction, Technology- Enabled Encroachment, and channel power: The Changing Balance Between Manufacturer’s Electronic Distribution and Established Retailers’, in *Proceedings of the 31st Hawaii International Conference on System Science*, IEEE Computer society Press: Los Alamitos, CA, vol. 32, p. 8.
- **Internet reference:** Lief, V. (1999) ‘Anatomy of New Market Models’, Forrester Research; <http://www.forrester.com> (8 February 2003).

Use footnotes sparingly (or not at all) and place them at the bottom of the column on the page on which they are referenced. Use Times 8-point type, single-spaced. To help your readers, avoid using footnotes altogether and include necessary peripheral observations in the text (within parentheses, if you prefer, as in this sentence).

10. References

List and number all bibliographical references in 9-point Times, single-spaced, at the end of your paper. When referenced in the text, enclose the citation number in square brackets, for example [1]. Where appropriate, include the name(s) of editors of referenced books. The references should not be more than 20.

[1] A.B. Smith, C.D. Jones, and E.F. Roberts, “Article Title”, *Journal*, Publisher, Location, Date, pp. 1-10.

[2] Jones, C.D., A.B. Smith, and E.F. Roberts, *Book Title*, Publisher, Location, Date.

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