

War Gaming as a Learning Activity

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Abstract. War games are the quintessential 'serious game'. While there are many types of war games and many reasons to conduct them, a crucial component for a successful war game is the learning objective. Yet, often the objective is glossed over, vague or totally absent. This paper examines the war game as a learning activity and illustrates how Bloom's taxonomy and other models can be used to formulate the learning objectives of war games. The intent is to offer advice to the novice on designing a better learning experience.

1. BACKGROUND

To state the obvious, a war game is a game about war, or various other military activities. Such a game may be played purely for entertainment, for historical study (Sabin, 2007), or used more seriously by military forces. War gaming has become an important tool in military training, planning and capability development.

Although earlier examples exist, the beginning of military use of war games is traditionally dated to 1811 (Caffrey, 2000. Smith 2010) when the Prussian Officer *von Reisswitz* invented a game that used a realistic representation of terrain, scale blocks to represent troops, and rules defining how units could interact with each other and the terrain. All modern military war games essentially follow that design and are usually defined along the lines of:

A war game is a simulation technique depicting operations involving two or more opposing forces, conducted using rules, data, and procedures designed to represent an actual or assumed military situation. (ADF, 1980)

2. TYPES OF WAR GAMES

War games (in the broadest sense) are used for a variety of tasks and take a variety of forms, for example: Command Post Exercises, Staff procedural Exercise, Seminar War Games, Decision Games, Course of Action War Games, Experimentation and Computer Assisted Map Exercises. (Longley-Brown, 2012, Shubik, 2009) All of these approaches represent opportunities to learn or to answer questions.

Military war games are often divided into three categories: training, experimentation and operational support. War gaming as historical study is a fourth category that is beginning to gain widespread use. All of these categories have some overlap and similarities. Often a war game is a combination of all four types.

2.1 Training

War games may be a means of **teaching** (Brewer, 1979. p 8) skills or concepts, such as command decision making or staff procedures, or a means of **practicing** (Perla, 1990. p181) these skills learned by other means.

They can be used to assess and evaluate competency (ADF, 2006), for illustration and example, or as an opportunity to gain experience.

The Australian Army identifies two types of training war game: the decision game and the procedural game. (ADF 1987)

The decision war game is focused on the commander, or the principal tactical staff and command team. The aim is to stimulate these players so that they can practice and experience making decisions in a realistic timeframe, with realistic information and with realistic feedback. This sort of activity may be preceded by other forms of training, such as tutorials and case histories, that aim to prepare the players for the types of decisions they will have to make. On occasion, mentors might guide the players through the decision making process, prompting or advising them as they go. After the war game, the performance of the players is normally reviewed to explore why they made (or failed to make) certain decisions, what cues they were looking for, what results they expected from their decisions, what contingency plans they had in place and so on.

The aim of the procedural war game is to practice, exercise or evaluate procedures and personnel. The players will be stimulated to perform various tasks, such as plan a campaign or conduct a medical evacuation. The normal records, reports, requisitions and other documents will need to be created and processed. The exercise may be set in realistic conditions, or may be a particularly stressful situation used to test the procedures. The focus is not on the decisions being made, but on the procedures that need to be followed as each stimulus occurs. In some cases the procedures may be found to be lacking in that they do not account for some events, or they are too cumbersome to operate under the exercise conditions. Alternatively, the players may be unfamiliar with the appropriate procedures and the aim of the activity may be to allow them to practice.

There is a third type of training war game, in which the players are permitted to explore the scenario and the options available to them. (Perla, 1990. p181) In this manner, participants may gain personal insight into the simulated reality of the game. Specific learning outcomes are not pre-determined, but emerge as the activity unfolds. It is clear that this approach requires a

high degree of validity in the simulation and careful monitoring of the activity to ensure that negative learning does not occur. At the same time, it may well be the controllers, sponsors and analysts that have the most to learn in this environment.

2.2 Experimentation & Exploration

War gaming and simulation has a long history of being used for technical, doctrinal and force structure experimentation. (Brewer, 1979. p6) The Australian Defence Force uses war gaming as a core component of its Capability Development and Experimentation (CD&E) program. (van Antwerpen, 2012) This includes everything from structured seminar games to high fidelity computer based simulations. Such games are used to examine potential future equipment and organisations.

War gaming can provide a method to test new concepts, equipment and procedures. It may provide a 'playground' to explore how new capabilities may be employed and what effect they may have on future operations, or merely as a platform for consolidating ideas and creating a common frame of reference. War gaming is also a useful guide that points to topics that should be investigated in more detail by other means.

2.3 Operational Support

Operational support war games fall into three categories: planning, walkthroughs and rehearsals.

In planning, war games can be used to examine or test (Brewer, 1979. p8) courses of action (COA). According to the Australian Army, this is one of the principle uses for war games. (ADF, 1996) Within the Military Appreciation Process, COA are tested using a simplified war game technique often examining a plan against the enemy 'most likely' course of action and the 'most dangerous' course of action. The war game is then used to refine the plan and establish decision points, timing and contingency options. Potential insights may also be gained by playing or viewing the war game from the opponent's perspective. (Shubik, 1975. p8-9)

Walkthroughs and rehearsals are often not considered strictly a war game as they lack the decision making component required for a true war game. (Longley-Brown, 2012) However, they do fall within the broad definition and certainly share some of the attributes of other war games.

The walkthrough is a valuable technique for visualising the anticipated sequence of events and ensuring all participants have the same understanding. Like the COA, it can be used to look for problems of consistency or completeness. (Shubik, 1975. p8)

A rehearsal is similar to a walkthrough except that its aim is to have all the participants go through the motions of the actual activity like a dress rehearsal for a play. This is to ensure that all of the necessary equipment, personnel, supplies etc. are operating as expected and to confirm timings, configurations and other details.

2.4 Historical Study

Many war games based on historical battles have been developed that are useful for student's wishing to 'get a feel' for a particular battle or period. For example, Phillip Sabin has developed a detailed model of ancient warfare specifically to try to understand the nuances of such battles. (Sabin, 2007 & 2012)

3. INTERACTIVE LEARNING ACTIVITIES

All of the categories of war games are used for some form of interactive learning. The training and historical study games have an obvious learning component. Experimental and exploratory games encompass learning in that they seek to answer questions such as how a particular piece of equipment can be used or how a given force structure can be employed. Similarly, the operational support games are attempts to gain insights about the strengths and weaknesses of a plan.

Understanding where a particular type of war game fits into the spectrum of learning activities can be helpful in determining appropriate objectives. Conversely, once a set of learning objectives has been determined, each of the learning activities can be assessed for suitability.

Learning is defined as "the process of acquiring skills, knowledge, and/or attitudes from study, instruction, or experience". (ADF, 2006) Interactive learning refers to learning approaches that involve the student in activities and hands on learning as opposed to passive learning modes such as lectures and reading text books. Interactive learning activities include: exercise, simulation, role-play, game and debate. (ADF, 2006) Most learning situations will include a blend of both approaches.

Henry Ellington and colleagues (Ellington, 1982) classified interactive learning activities into three primary groups: simulations, games and case studies and used a Venn diagram to illustrate how these classifications overlap.

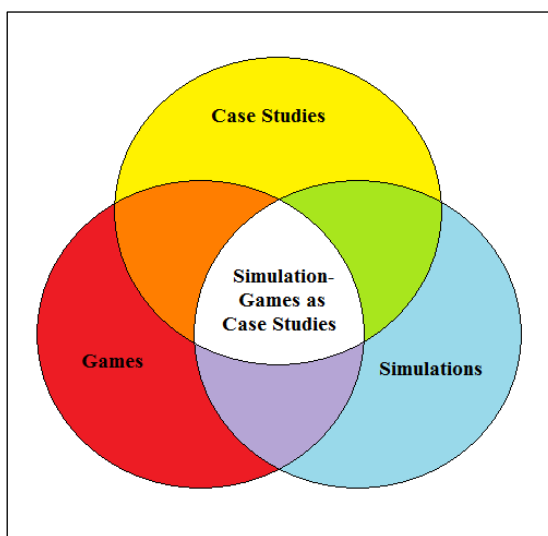


Figure 1: Ellington's Interactive Learning Categories

The intersections of the three primary categories result in seven categories which are summarised by Leigh and Kinder (Leigh, 2001) in the following way:

Games: time limited; rule oriented; scored; outcomes oriented; win or lose focused.

Simulation games: combining some representative aspects with a highly competitive and time and rule driven process.

Simulations: open ended; behaviour oriented; real-life focused; process oriented.

Simulated case studies: also representative of aspects of real life, but not usually competitive and focusing on highly specific skill transferring tasks.

Case studies: for in-depth analysis; detail oriented; focused on the results of actions.

Games used as case studies: intended to provoke analysis usually of specific scientific knowledge and similar complex data.

Simulation games used as case studies: with characteristics of all three modes, these are complex and challenging and are the most educationally powerful.

In essence, simulation, game, and case study may be considered attributes of an interactive learning activity and a given activity will exhibit elements of each attribute.

War games are, by definition, a simulation of some form of military activity. Most war games include a strong competitive element, although some planning and experimental games downplay this element. Many war games include a debrief phase or after action review where the events of the scenario are discussed and reflected upon as a case study. This reflection and discussion is often where the potential for learning is greatest. Thus, war games should generally be categorised as a “simulation game used as a case study”, or a case study based on a game.

3.1 War Games and Learning Activities

In the decision game, the simulation and game elements are paramount. The competitive element of a game is important to create the tension and pressure in the mind of the decision maker/ player and to provide a live thinking opponent. The procedural game places less emphasis on competition and relatively more on the simulation and case study elements, although both utilise the debrief for reflective learning. Experimentation may emphasise different elements depending on the focus of the experiment, but typically a very detailed analysis of the data generated by the scenario (ie. case study) is a crucial component. Course of action analysis and rehearsal both rely on the case

study element of the activity as their primary means of analysis and significantly downplay the game aspects.

Additionally, these types of activities have an important role to play in evaluation and assessment by allowing the learner to demonstrate what they have learned. This is potentially one of the more powerful aspects of war gaming. The rehearsal or ‘shake down’ is a prime example of this type of activity where the readiness of a learner or team is demonstrated by running through an exercise. Similarly, a decision game may be the culmination of a learning program where the knowledge gained is applied to a simulated situation.

4. COMPONENTS

When developing or conducting a war game, it can be helpful to break it down into a number of components. Perla identifies seven components that exist in a war game: objective, scenario, database, models, rules, players (or decision makers) and analysis. (Perla, 1990. p165-7) However, there are some additional components that should also be considered as part of the activity, if not part of the actual game.

Perla groups rules and procedures together, but this tends to create confusion. Rules are distinguished from procedures in that rules refer to how events are adjudicated (ie the rules of the game) while procedures define how to manage and run the activity. For example, adjudication rules include assessing damage from engagements, inter-visibility and movement rates, while the procedures include setting up, packing away and operating equipment, participant briefings, and assignment of roles. In modern computerised war games, the adjudication rules are principally, though not entirely, embedded in the software.

‘Players’ are an important part of a game, but there are many other participants involved in the conduct of a complete activity. The Australian Army developed “The Activity Model” during the 1990s to describe participant roles within a typical war game or exercise. (Figure 2) This helps to identify procedures that are needed and who is responsible for their execution. Recently, a similar model, developed by NATO, has been published. (Cayirici, 2009)

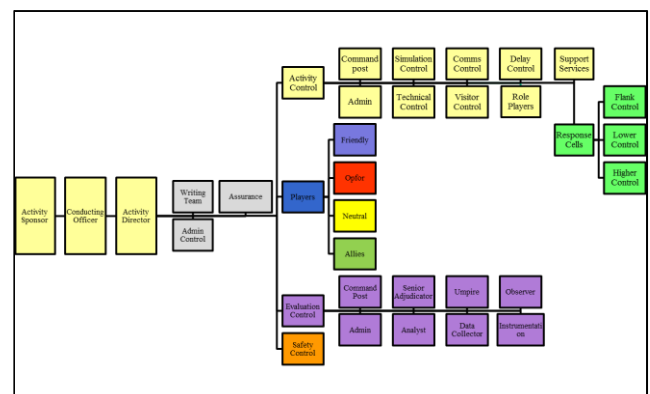


Figure 2: Australian Army Activity Model (Roles)

It is important to understand that the roles identified in this model do not necessarily bear a one to one

correspondence to appointments. Depending on the size and focus of the activity, one person may fill multiple roles, or a single role may need a team to perform it.

Identifying equipment (sometimes called ‘gameware’) is important as it often imposes constraints and limitations on the war game. Examples of game equipment include maps and counters, computers, sculpted terrain or sand tables, and miniatures. In addition to the equipment used in the game, often supporting equipment is also used such as printers, projectors, command and control systems, radios and other communications systems, and audio visual equipment. The type of equipment being used and the facility influence the types of war games that can be conducted and the support requirements.

5. OBJECTIVE

Central to most descriptions of a war game is the objective. This defines what is expected to be achieved by the war game and how it will be delivered. In the context of a learning activity, the objective (or objectives) is often called a ‘learning objective’ or ‘learning outcome’. An important element of the description of a learning outcome is a specification for how its accomplishment will be assessed.

The centrality of the objective is echoed in the training methodology used by the Australian Army. (ADF, 2006) The Defence Training Model (DTM) is a systems approach to training focused on work place performance and competency. The five phase methodology is illustrated by the following diagram.

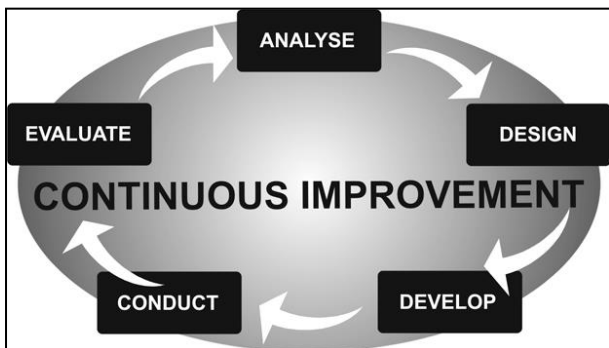


Figure 3: The phases of the Defence Training Model

In the Analyse phase, the training need is investigated resulting in a definition of the learning outcome. The Design and Develop phases produce a training solution aimed at delivering the outcome during the conduct phase. The Evaluate phase assesses if the training was effective in delivering the intended outcome. The continuous improvement framework represents the review and feedback processes that are applied at all stages to maintain the focus on delivery of the outcome.

War games have a role to play in many of the phases of this cycle. As well as being a means of conducting the training, they can also be used to support the training needs analysis and assessment of learner performance. Simulation, including war gaming, is specifically identified as a means of assessment in the DTM.

6. LEARNING OBJECTIVES

Bloom's taxonomy is a method of classifying learning objectives developed in the 1950s and subsequently revised and extended. It divides learning objectives into three domains: psychomotor, cognitive and affective. These are often referred to as skills, knowledge and attitude respectively. Within each domain, objectives are classified in a hierarchy beginning with basic competence and developing to mastery. The intent is to provide a vocabulary for specifying learning objectives at each level.

It is often the case that interactive learning activities have the greatest application at the higher levels of learning, while more passive approaches are suitable at the lower ends. For example, learning and remembering ‘facts’ can be achieved through reading and private study, but applying procedural knowledge is often best practiced and demonstrated through real or simulated job performance.

6.1 Psychomotor Domain

A number of models for the psychomotor domain have been proposed. The model suggested by Dave (Chapman, 2012)¹ is quite well suited to adult skills training and is most straight forward. For a given skill, one first learns through imitation and then practices until the skill become second nature.

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| Imitate | Observing and patterning behaviour after someone else. |
| Manipulate | Being able to perform certain actions by following instructions and practicing. |
| Refine (precision) | Becoming more exact or working and reworking something so it will be 'just right'. |
| Coordinate | Coordinating a series of actions, achieving harmony and internal consistency. |
| Naturalise | Having high level performance without needing to think much about it. |

6.2 Cognitive Domain

The cognitive domain refers to knowledge of a particular subject and follows a similar hierarchical design. (Anderson, 2001)

| | |
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| Remember | Retrieving, recognizing, and recalling relevant knowledge from long-term memory. |
| Understand | Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, |

¹ Many sources refer to the work by Dave (Dave, 1970). However, the author has been unable to access a copy directly.

| | |
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| | comparing, and explaining. |
| Apply | Carrying out or using a procedure through executing, or implementing. |
| Analyse | Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing. |
| Evaluate | Making judgments based on criteria and standards through checking and critiquing. |
| Create | Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. |

Typically, the knowledge domain is further divided into four categories:

Factual: knowledge of terminology and specific facts and details.

Conceptual: understanding the interrelationships of the basic element, classifications, categories, structures, principles, theories and generalisations.

Procedural: describes how to do something, including algorithms, techniques, methods and the criteria for applying them.

Meta-cognitive: is an understanding of the cognitive process in ones' self and others.

6.3 Affective Domain

The affective domain describes a learner's understanding of attitude, interests and values and the way they respond emotionally to situations.

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|----------|---|
| Receive | The lowest level; the student passively pays attention. Without this level no learning can occur. |
| Respond | The student actively participates in the learning process, not only attends to a stimulus; the student also reacts in some way. |
| Value | The student attaches a value to an object, phenomenon, or piece of information. |
| Organise | The student can put together different values, information, and ideas and accommodate them within his/her own schema; comparing, relating and elaborating on what has been learned. |

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|--------------|--|
| Characterise | The student holds a particular value or belief that now exerts influence on their behaviour so that it becomes a characteristic. |
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6.4 Application of the Taxonomy

This approach has two uses in the formulation of learning objectives and designing learning activities. In the first instance, it is important to define what knowledge, skills or attitudes should already be present as a precursor to the next stage of learning. Secondly, this approach lends itself to defining or describing desired learning outcomes or statements of competence. For example, prior to undertaking learning aimed at 'applying' a procedure, it must first have been learned and remembered. As noted above, clearly defining what knowledge, skills and attitudes are to be demonstrated and evaluated is important for the learner and instructor.

In most situations, it is relatively easy to describe learning objectives for the cognitive and psychomotor domains. It is often more difficult to specify affective learning outcomes. However, simulation-games are a potentially effective method of exposing learners to the emotions and values of others as well as themselves.

6.4.1 Decision Game

In the decision game, participants are expected to be able to rely on existing procedural knowledge and associated skills, and to analyse and evaluate factual and conceptual knowledge to create a plan of action, complete with contingencies. They are then expected to exhibit the skills and attitudes associated with teamwork and leadership to carry out the execution of that plan. They are further expected to be able to analyse new information as it is presented, to interpret the capabilities and intent of their opponent and create or amend plans to counter those actions. At its most realistic, this type of activity has the greatest potential to teach and demonstrate the affective domain, as participants will be in a stressful environment and will need to demonstrate control of their own emotional responses, work with others in their team, and attempt to 'get inside the head' of their opponent.

Learning occurs within the execution. It also occurs in reflection during and after the debrief. It is particularly enlightening to contrast the perspectives of the various participants all of whom had an incomplete picture of the scenario as it unfolded.

6.4.2 Procedural Game

The procedural game focuses on application and demonstration of procedural knowledge and skills. The participants are expected to respond to stimuli and cues and enact the appropriate procedures. Often these activities emphasise communication and teamwork. Within the context of specific procedures, higher orders of capability may be required, for example in analyzing and evaluating presented factual information, and tailoring an existing procedure to suit.

6.4.3 Historical Study

Typically these types of activity revolve around learning, understanding and analyzing historical data and events. In attempting to generalise the knowledge gained, the learner will also work through the various levels of conceptual knowledge seeking a broader understanding of how this particular study fits a concept or paradigm.

6.4.4 Experiment

An experiment that is designed to test an hypothesis falls into the higher levels of the cognitive domain. It is in part a form of analysis, but it is based on earlier efforts of evaluation and creation. A rigorous experiment also relies on a demonstration of appropriate skills and procedural knowledge as well as appropriate behaviours and attitudes.

6.4.5 Exploration

This type of activity has the broadest scope of objectives, but, in some cases, has significant potential to result in new understanding. It can be used as a means of learning and understanding factual and conceptual knowledge, gaining insight into other's values and manipulating, refining and coordinating skills. To be effective, considerable emphasis should be placed on reflection, debrief and guided learning.

6.4.6 Course of Action

This activity shares some of the characteristics of exploration. An hypothetical course of action is 'tested' for flaws and insights. It relies on application and understanding of technical and procedural knowledge. However, it also emphasises an understanding of the capabilities, doctrine and likely intent of the opponent.

6.4.7 Rehearsal

A rehearsal can be conducted at many levels, but essentially offers an opportunity to demonstrate procedural and conceptual knowledge of and skills in the required tasks.

7. CONCLUSION

War games, and related activities, have considerable application as both learning devices and evaluation tools. Correctly designing and structuring a war game is crucial to gaining the most from the activity. Defining the learning objectives and ensuring that the activity remains focused on them can often be challenging. By carefully considering how the activity fits into an overall learning plan, the most appropriate type of war game can be developed. This paper has illustrated a framework to help the designer in this task.

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