



Principles of Educational Digital Game Structure for Formal Education

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1. Introduction

Characteristics of Game for Education

✓ **Context**

- provides players with a sense of reality for the learner's activities

✓ **Immersion**

- leads players to experience “flow’ in gaming
- contributes to player’s active learning
- empowers learners by motivating them to learn

✓ **Interaction**

- Meaningful learning starts with interaction

Learning with game tries to achieve given objectives based on those factors





1. Introduction

internal structures of games

activities of players

Games require the **creativity**
of teachers and learners
in finding the best usage.

activities in learning with games

types of application





2. Internal Structure of games

The frame of a game confines the activities of players to learn and to play.

- ✓ Intrinsic versus Extrinsic
- ✓ Template versus Custom Designed
- ✓ Reflection versus Action
- ✓ Synchronized versus Asynchronized
- ✓ One user versus Multi user
- ✓ Session versus Persistent
- ✓ Story versus Twitch





2. Internal Structure of game

1. Intrinsic versus Extrinsic

Intrinsic games

- have an integrated learning contents with the framework of the game (Malone, 1980).
- Most simulation games are examples.
- Learning can not be separate from gaming.

Extrinsic games

- have a separate or less integrated scenario with learning contents (Malone, 1980).
- Learning and gaming are independent activities.
- Gaming remains unchanged when the learning contents are replaced.
- are economical in developing and maintaining with ease.





2. Internal Structure of game

2. Template versus Custom Designed

Template based games

- consist of several steps or assembled modules.
- developed using authoring tools.
- can support various activities/topics of learning.
- Each module can have a distinctive objective of learning.
- Instructors can control the learning path/contents for the players.

Custom designed games

- developed as a whole single unit.
- rather tightly interwoven.
- support comparatively long term objectives of learning.
- Instructors cannot control the learning path/contents for the players.





2. Internal Structure of game

3. Reflection versus Action

The player's thinking in gaming is important as an internal process of learning.

Reflection Games

- Games requiring instant reaction do not necessarily ask players to think reflectively.
- Reflection during action-oriented gaming often makes the game play boring

Action Games

- Action games require less reflective thinking than role playing, adventure and simulation games

One of the issues for the use of games in learning is how to balance/match action and reflection to best fit its purpose.





2. Internal Structure of game

4. Synchronized versus Asynchronized

Synchronized games

- do not allow player's pause to think.
- do not allow player's involvement in other activities simultaneously.
- Multi User Synchronized Games
 - can add higher levels of immediacy/interest/fun for players
 - Players can perform significant activities only when they react in real time in the same space.

Asynchronized games

- wait until the player input responses unless it set a time limit.
- Multi User Asynchronized Games
 - get reactions from players only when they input responses.
 - cannot provide the same level of immediacy as a synchronized game.





2. Internal Structure of game

5. One user versus Multi user

One user games

- Most game based learning has been pursued in an independent manner in “one user” situations.

Multi user games

- Nowadays network and internet technology has made it possible to play multi user network games.
- Multi players are solving problems effectively and efficiently together at a distance.
- This can be a good example of co-construction of knowledge.





2. Internal Structure of game

6. Session versus Persistent

Session games

- are opened and closed by the player.
- exist only when players want to continue playing.
- One player can make the rest players stop the game.

Persistent games

- continue like the daily life of players.
- Players can pause anytime and restart the game at their will.
- Players can accumulate their knowledge and skills over time.





2. Internal Structure of game

7. Story versus Twitch

Story based games

- have various lengths and depth of detail.
- affect the affective domain and recall of players
- A movie is an example of a long story.
- When the learning objective is rather long-term, then adopting stories is the best alternative.

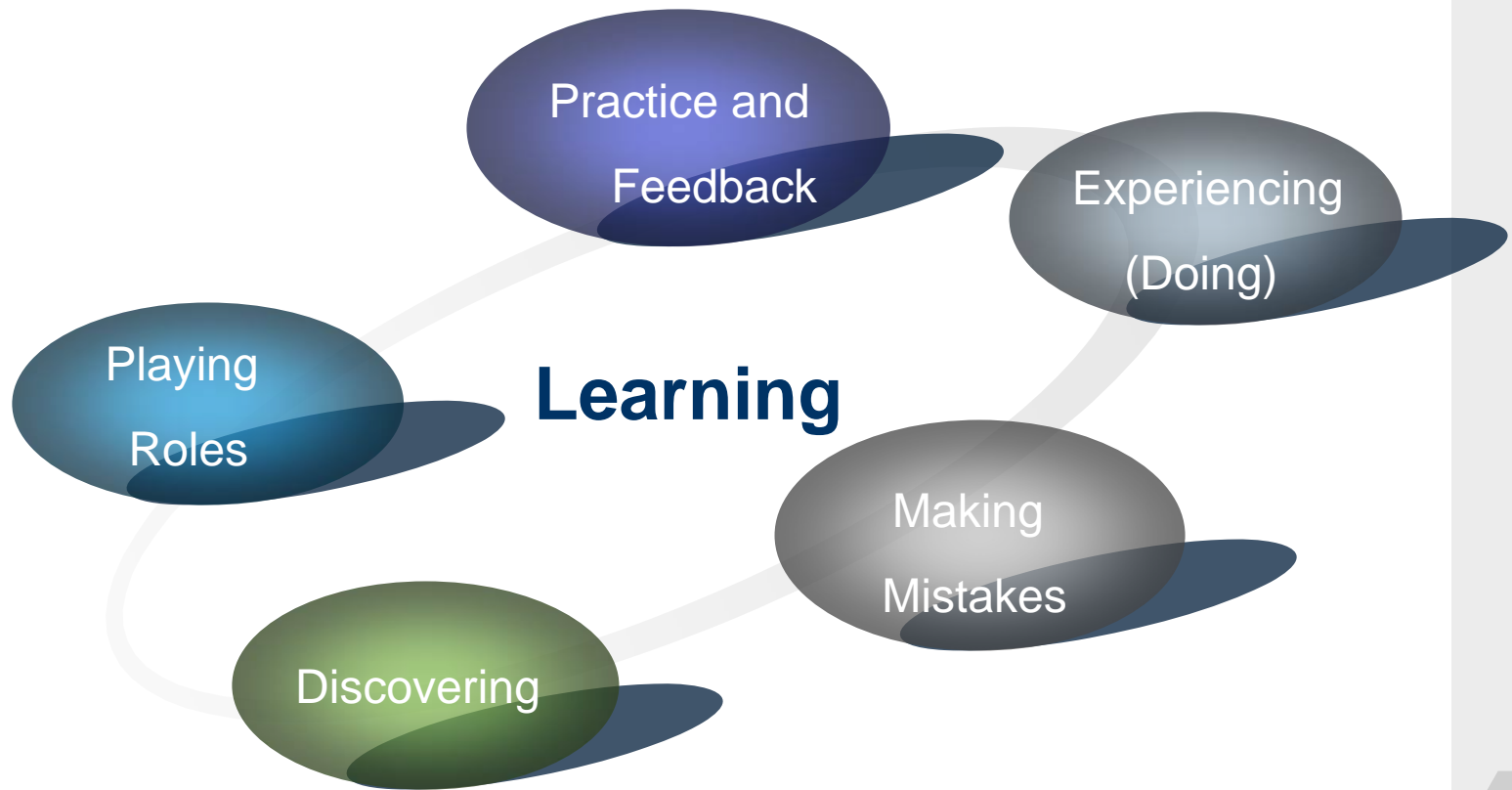
Twitch games

- concentrate on just a series of actions.
- can induce player's involvement and achieve short term objectives.
- are effective in prompt responding and in stimulating quick memorizing as in language learning.
- can constitute effective and interesting experiences for players by prompting clues and getting quick responses.





3. Activities in Learning with Game





3. Activities in Learning with Game

1. Learning by Practice and Feedback

drill and practice

- Drill & practice have been used widely in flash card games.
- This interaction type has been blamed for being simple and not requiring thinking in the process.
- This was apparently an effective use but not that much fun.
- Even though adaptive functions have been added to this initial type of interaction, it is still recognized as a primitive interaction.
- It has been widely used until now, especially to reinforce already obtained knowledge and skills.





3. Activities in Learning with Game

2. Learning by Doing

experiential learning

- Learners are developing their skills, attitudes and thinking based on doing and experiencing in gaming.
- Players create and renew their knowledge by solving problems.
- applies to recognizing a problem to solve, generating ideas, testing them, observing the results and lastly identifying or changing previous concepts.

This ongoing process of trial and error makes cognitive reconstruction happen and leads to meaningful learning.

This “hands-on, minds-on” process includes all activities of active participation, motivation to learn and learner centered knowledge construction.





3. Activities in Learning with Game

3. Learning by Making Mistake

Making Mistakes

Making mistakes is a big part of game play.

It represents one of the most common activities in gaming.

The players relentlessly proceed toward the goal of the game and get feedback from the game.

The players repeat trials and errors. Then finally, they learn what was wrong and what was right.

Gaming fits in this process because the players are highly motivated to continue. So making mistakes is a starting point for learning with games and then feedback directs the players to proceed in gaming.

If the feedback gives the player internal motivation and satisfaction, learning becomes more effective.





3. Activities in Learning with Game

4. Learning by Discovery

Discovery

Participants learn more when they discover facts, rules and knowledge by themselves than when knowledge is pre-packaged and delivered to them.

Discovering happens when learners find clues or pieces leading to solving problems.

Thus learning by discovering may happen when they are asked to organize learning contents. In this process they relate and classify each learning object, finding commonality and relationship between events and objects using given information.





3. Activities in Learning with Game

5. Learning by Playing Roles

Playing Roles

Through taking specific roles and playing them in games, players can understand the problems, causes and effects caused by social interaction taking place around them.





4. Types of Application

In this section, how and when a game can be used in the class is summarized.

- ✓ To Motivate
- ✓ To support main curricula activities
 - Problem solving / Exploring
 - Memorizing / Practicing
 - Absorbing / Obtaining
 - Manipulating and Observing
- ✓ To Strengthen What is learned
- ✓ To Summarize and Evaluate What is learned





4. Types of Application

1. To Motivate

To make learners curious

To maintain their concerns

To challenge them to learn

A well selected game can provide learners with more intrinsic motivation to start than many other instructional strategies (Lepper & Chabay, 1985).





4. Types of Application

2. To support main curricula activities

Problem solving/Exploring

When the learning objective is to solve given problems, a game should lead players to define the problems by themselves, and build the problem solving strategies by offering new problem circumstances.

Learners can develop higher order thinking abilities such as reasoning, logical thinking and critical thinking and so on from exercising their skills and strategies during problem solving.

If a game consists of a small set of problems, then it can be used in a short period of teaching. A problem that takes time to solve problems requires multiple teaching sessions.

Depending on the type of a problem, a game can be played in groups to solve.





4. Types of Application

2. To support main curricula activities

Memorizing/Practicing

In certain areas of Math and Language Arts, memorizing can be effective. Games used in this area are often used to get new facts and to store them in long term memory.

The main procedures of memorizing/practicing games are presenting the question or problem circumstance requiring learner's immediate response, collecting the answer and giving direct feedback.

For example, teachers can use games such as puzzle or quiz for quick and easy memorization.





4. Types of Application

2. To support main curricula activities

Absorbing/Obtaining

Even a simple and short game can deliver new facts and rules. In addition, complex and long games aim to deliver specific procedures and complex relationships to players.

Playing complex games such as adventure, RPG, and simulation games can support obtaining knowledge from simple to higher order skills.





4. Types of Application

2. To support main curricula activities

Manipulating/Observing

When the learning objective is to explore the relationship between variables and to get acquainted with a real world, a simulation game is recommended.

Most simulation games aim for transfer to real life with a saving of space and cost. In classroom teaching, teachers can use simulation games for scientific exploration as well as indirect real life experiences





4. Types of Application

3. To Strengthen What is learned

Learning contents in a game should be open and divergent.

The game should carry various topics related to what players have learned.

The game should emphasize closely related inter-subjects and be adaptive to individual player's need and interest.

The game should hold contents for interpretation, understanding and generalization.

So the game has to present further and successive studies for players.





4. Types of Application

4. To Summarize and Evaluate What is learned

Presenting the summary with fascinating elements such as simulations and animations is effective.

A simple puzzle and/or quiz embedded in an adventure or a role playing game can be used.

Feedback as a clue for deciding the subsequent learning path is helpful.





5. Obstacles & Solutions

Technical and budget limitations

Limited time span of individual classes

Lack of verification

Lack of support materials

Lack of time to familiarize

Curriculum unsuitability

Loss of learning momentum





5. Obstacles & Solutions

1) Support materials:

List of Games and Guidelines includes:

- scenarios that can be enacted through the game
- methods of evaluating the player's performance
- cases or exercises for the players to work through

2) Teacher Training

- In familiarizing themselves with the educational components of the game
- In integrating games into ongoing curriculum activities
- In tailoring the games to the curriculum to map onto it





6. Suggestion

Indicators of good teaching/learning with games

Did the game provide players with fun?

Did the participants think of themselves as learners/trainees or players?

Were they enthusiastic?

Would the players recommend the game to their colleagues?

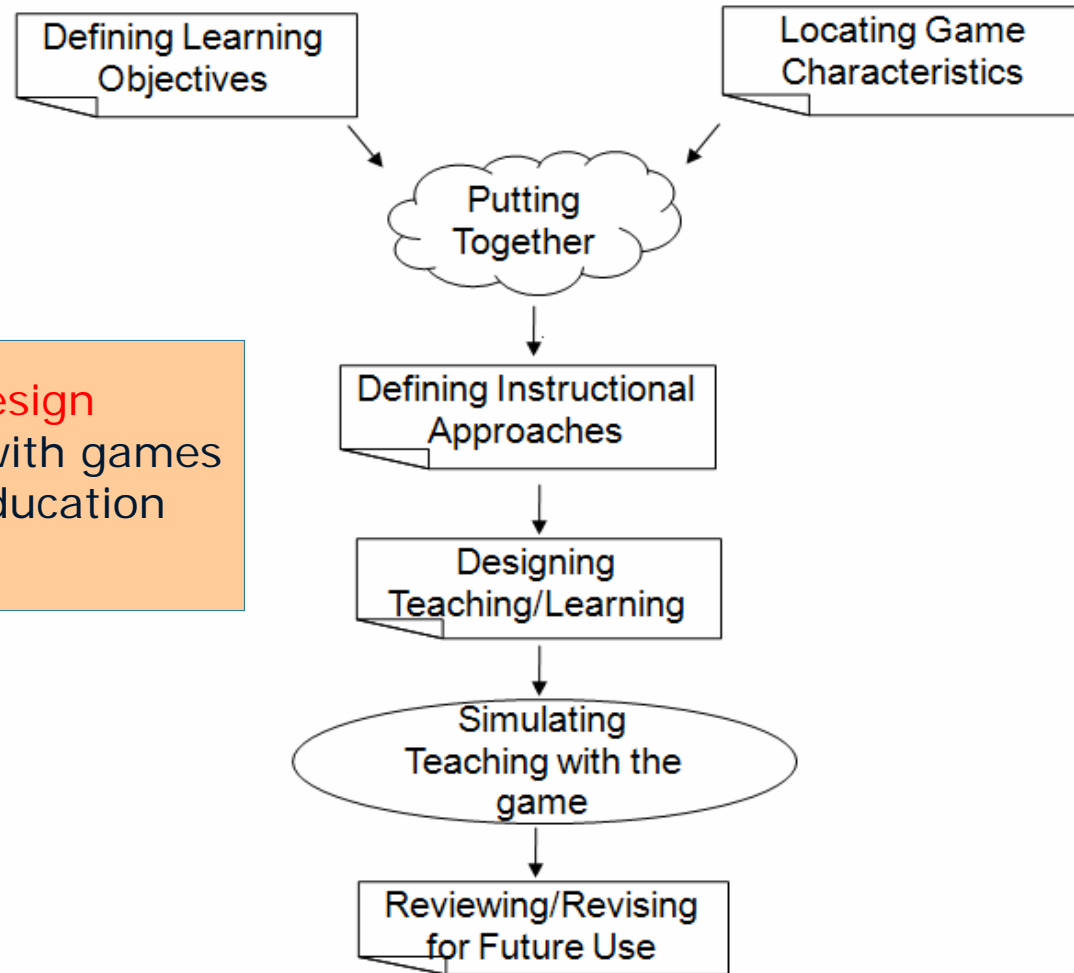
Did the game facilitate reflections of players?

place fun first,
and then
learning next !





6. Suggestion



Instructional Design
for Teaching with games
in Formal Education
Settings.





Thank You!

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