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From Comenius to Counter-Strike, 400 years of Game-based learning as a didactic foundation

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Abstract: The Czech philosopher John Amos Comenius has been presented as the father of modern didactics. He also favoured learning by doing and believed in "the art of turning all our schools into games". Furthermore, Comenius had the idea of a flipped classroom with a four-hour school day, divided into two hours in the morning and two hours in the afternoon. The time in between is recommended to be spent on preparation, play and to explore nature. Comenius saw play as an important didactic strategy since play is an imitation of life itself. Most importantly, Comenius wished games/play and learning to be integrated. He envisioned "a school in which the serious and the fun are mixed" (Comenius, 1657B, [xviii]).

This study has been carried out as a central and comparative literature review. Central in the sense of reviewing a body of literature that is central to the chosen topic, and comparative in the sense that texts describing ideas from the Comenius era have been compared to contemporary ideas. The historical texts were studied using a contextual method, viewing Comenius's works as moves in an argument, as described by Skinner (1996).

The comparison reveals both similarities and differences. The concepts of learning by doing, 'facilitas' and to flip the classroom, are all didactic ideas aligned to game-based learning today. Some examples of learning initiatives and schools fundamentally built upon the idea of 'learning by gaming' were found, but the idea still seems radical to most educators. Comenius would probably have loved the rich abundance of games and gamification today, but certainly not shooting games like Counter-Strike. Comenius's vision was more one of a peaceful utopia with enlightened citizens. Finally, it is hard to tell if Comenius, alive today, would find the 21st century digital games to support or to interfere his Epicurean idea of a 'direct vision'.

Keywords: Game-based learning, GBL, Play-based learning, Didactics, Comenius

1. Introduction

Game-based learning (GBL) has a long history with board games like Xiangxi, Chatranga, Chess and variations of Mancala used for thousands of years in educational contexts for training strategic and tactical thinking (Moore, 2015; Bikić & Vuković, 2016). GBL has always been associated with the didactic idea of learning by doing or learning by playing. This concept that was promoted by the 17th century Czech philosopher John Amos Comenius who also believed in "the art of turning all our schools into games" (Atwood, 2009, p. 384) in a concept named Schola Ludus.

Like contemporary GBL researchers like (Lofgren and Fefferman (2007), Comenius saw play as an important and natural didactic strategy since play and games are imitations of life itself. As highlighted by 20th century pedagogue Jean Piaget (1993, p 182), Comenius emphasis on imitation and group games has stood the test of time. His ideas of a 'school through play' and to use games as a preparation for future work (Vankuš, 2012, p 21) still seem radical in the 21st century.

GBL today is an emerging field with a wide variety of didactic concepts building on the identified fact that games can create intrinsic motivation and flow (Voiskounsky, 2004; Paras, 2005). Game play today does not necessarily involve sitting on a chair in front of a screen. There are also location-based games including augmented reality gaming in outdoor activities (Freitas, 2006). Another recent trend is to combine GBL with the 'Flipped classroom' concept (Klein, 2017; Hung, 2018). This comparison of Comenian ideas and contemporary trends in GBL would hopefully give the reader a better perspective on trends in today's GBL didactics. The main research question to
answer is: Which similarities and differences can be identified in a comparison of Comenian ideas in the 17th century and contemporary GBL trends?

1.1. Aim of the study

The aim of this study is to analyse, compare and discuss some of the GBL concepts presented by John Amos Comenius in the 17th century with current trends in GBL research.

2. Extended background

Game-based learning often has a focus on 21st century digital games, but most of the underpinning concepts have a far longer history.

2.1. Game-based learning

Board games have been used in educational contexts for thousands of years to teach and learn strategic and tactical thinking (Moore, 2015). Games and play-based learning were frequently used didactic ideas in ancient Greece. However, the idea that education could be entirely game-based was first proposed by John Amos Comenius in the 17th century. He envisioned a school which it would be a pleasure to attend or, as he put it in the Pampaedia: "schola vera lusio mera" ("a true school is pure play") (van Vliet, 1994).

During the Enlightenment French philosopher Jean-Jacques Rousseau propagated for the use of games as an appropriate and free activity for children (Vankůš, 2012, p 23). Later during the Romantic era the German poet and philosopher Friedrich Schiller shared Rousseau’s ideas about games and free play. Schiller also believed in the concept of a play drive (‘spieltrieb’), and that we are fully human only when we play (Schiller, 1794). The idea of a natural and fundamental need to play was later elaborated on in the 20th century by the Dutch historian Johan Huizinga in his book Homo Ludens (Huizinga, 1938).

The stimulating and motivational effects of games have been mentioned earlier, but they were for the first time more systematically explored in the 1970s and 1980s by Frank Lepper and Thomas Malone. With the basic idea of making learning fun, they studied how computer games with catchy graphics and music could be used to motivate students for solving mathematical problems (Malone & Lepper, 1987). In the rapid digitalisation during the last decades many classic play and game concepts have been digitised at the same time as the quality of digital media has improved.

In the rich plethora of games today there are also the subclasses of educational games and serious games. Educational games are developed with the aim of learning by playing, and serious games should be based on specific learning outcomes. However, it is hard to make clear definitions, and instead of a division the differences could be seen as a continuum as suggested by Marsh (2011).

<table>
<thead>
<tr>
<th>Games</th>
<th>Educational games</th>
<th>Serious games</th>
<th>Simulations</th>
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<td>video games with fun &amp; challenging gameplay for purpose</td>
<td>game environments &amp; simulations with fewer gaming characteristics for purpose</td>
<td>experiential &amp; experimental environments with minimal to no gaming characteristics for purpose</td>
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Figure 1. The learning game continuum (Marsh, 2011)
2.1. Comenius and Schola Ludus

John Amos Comenius (1592-1670) is well known as one of the classics of the history of educational theory. His views have inspired many modern educational thinkers, with good reason. He was in many ways the first to establish what he himself termed Didactics as a field of study in its own right. His views on education were far-reaching and explicitly universalistic. He wanted to build Didactics from the ground up. He laid new philosophical foundations for the discipline but was also deeply engaged with the development of educational practice.

Furthermore, historians have, especially in recent years, taken an increasing interest in Comenius’s system of ideas as a whole. Being simultaneously typical of his age and a very unorthodox thinker, Comenius’s educational ideas were based on an eclectic but idiosyncratic combination of Renaissance humanism, nonconformist Protestant theology, and Paracelsian alchemical ideas. He had a strongly optimistic view of human nature which is fundamental in his educational thought. As with earlier Renaissance thinkers, this optimism derived largely from a kind of Neoplatonism that was a prominent feature in Europe in Comenius’s day (Patočka, 1971; Čižek, 2016, Lischewski, 2010).

Comenius’s optimism is what leads him to argue for teaching ‘everyone everything’. This means universal education: because man’s reason has unlimited potential, and because human nature is identical in every human being, everyone, irrespective of sex or social status, should be given the opportunity to study, and everyone should be taught at least the basics of every subject. Needless to say, this ideal was highly original in 17th century Europe, and never achieved in practice until the development of a modern school system in the late 19th and early 20th centuries.

For the present purpose, the most important thing to say is that he also advocated a distinct didactical method. Comenius had much faith in this method, which he argued to be “infallible”. The general didactical method is the framework within Comenius put forward his views on the role of games/play (lat. ludus) in learning. The general views on method are presented in Comenius’s most well-known pedagogical work, the Didactica Magna (publ. 1657), and the specific argument for what may, without anachronism, be called game-based learning, is put forward in the perhaps slightly less well-known work Schola Ludus (first publ. in 1654). Together they form, in our view, Comenius’s ludology, that is a systematic ‘theory of play’.

Jean Piaget has argued that it is necessary to take the whole Comenian philosophical system into account in order to make it meaningful in modern terms. From that point of view, it then becomes clear that what makes Comenius appear to be so modern, despite the antiquity of his metaphysical foundations, is the fact that he “was able to give an extremely practical significance to the key concepts of his philosophy.” (Piaget, 1968:29) This is clearly apparent in Comenius’s views on games in the educational context. In the dedicatory epistle to Schola Ludus, Comenius first presents a formal definition of what a game (Ludus) is. His definition generally emphasizes the need for freedom and enjoyment in education, and these in turn serve the didactical goal of efficient learning.

2.3. Comenii Didactica

Comenius, as many philosophers of the Renaissance, held that educational methods should be natural, that “art should imitate nature” (Comenius, 1657A:71). This entailed many particular views on teaching methods, but the overall aim was that a natural method would achieve “facility” in learning. Firsts of all this means building from the ground up: laying good foundations. An important part of this is attentive pupils, which is one of his reasons for advocating games and fun in learning (Comenius, 1657A:89).

Comenius argues that “words” and “the things themselves” should be learnt together and also that “learning” and “teaching” must go hand in hand, as must “the fun and the serious” (Comenius, 1657A:110). Comenius wished all theoretical knowledge to be connected to practice and that learning should build from sense perception. He advocated the use of practical examples in teaching, as well as teaching aids available at the time, such as images, optical instruments, globes, maps, practical experimentation and even a garden, preferably adjacent to the school itself. This he saw as a means of getting to know the earth herself through first-hand experience. Not least he considered games and dialogue as good examples of a “mix of the useful and the
pleasant” (“miscere utile dulci”, from Horace) (Comenius, 1657A:77-80, 85). It should be noted that Comenius states that schools should only teach serious content, but that they must still do so in a “fun” (ludicra) manner (Comenius, 1657A:88).

Comenius uses the games played by children as examples of how it is possible and effective to learn by imitation alone, without the need of abstract rules – this is exactly how children learn to play games (Comenius, 1657A:122). The work in which Comenius developed an explicit theory of games in relation to learning is the Schola Ludus. This provided a model for language education through drama (on this aspect, see for example Cesnaková-Michalcová, 1994). However, the discussion of games in the dedicatory epistle to this work is not specific to drama, but treats games in learning in general. Comenius posits seven criteria for “what makes a game a game” (lat. ‘ludus’, meaning both ‘game’ and ‘play’). These are:

1. Movement
2. Spontaneity
3. Collective activity
4. Competition
5. Order (rules)
6. Facility
7. A purpose (“the relaxation of the soul”)

For the purposes of this article, we need only focus on points 2, 3, 4 and 6. The second point is perhaps the most important. In a game, Comenius argues, the enjoyment comes from spontaneity, as it is not a game if you are forced to play. This is significant: Comenius goes on to comment that “it is through free will that man reaches the highest degree of excellence [...] even in the slightest and most playful things.” (Comenius, 1657B, [xiv])

The third point in Comenius’s set of criteria is that games are a collective enterprise. Games are enjoyed because they are played together with others, and human beings naturally seek the company of his fellows (an idea ultimately derived from Aristotle). This is why we, if we cannot find a “co-player”, still divide the game between our right and left hand (to play two sides) (Comenius 1657B, [xiv-xv]). Thus, it is in the nature of games that they are social, and this is another aspect of games which makes them natural and appropriate for human beings to engage in.

In point four, Comenius highlights the benefits of the competitive aspect of games. Everyone strives to win a prize or the honour of being the victor. This creates joyful excitement: we experience a “titillation of the soul” when we find ourselves suspended between “hope and fear”. As this positive view of the emotional effect of competition was bound to be (and perhaps still is) controversial, Comenius is quick to point out that these emotions are of a harmless kind (Comenius, 1657B, [xv]).

Perhaps even more important than these formal criteria for the definition of games is Comenius’s overall view of the value of games in education. He argues that playfulness and “fun” should be integrated in learning to the extent that school should itself becomes a form of play. He writes: “no one should be admitted to school as a lazy spectator, everyone should be a vivid actor, who does whatever he or she sees the teacher or his fellow students do.” (Comenius, 1657B, [xvi-xvii]) And he puts much emphasis on that games and study should be combined. His ideal is “a school in which the serious and the fun are mixed” (“serio-ludicris contemperatam Scholam”) (Comenius, 1657B, [xviii]).

3. Method

The study was carried out as a central and comparative literature review with a design that was inspired by the six-step method described iby Machi and McEvoy (2016). Central in the sense of reviewing a body of literature that is central to fulfil the research aim, and comparative in the sense that found themes from the Comenius era have been compared to found contemporary ideas. The older historical texts were studied using a contextual method, viewing Comenius’s works as moves in an argument, as described by Skinner (1996). Different databases have been searched with different combinations of keywords for contemporary GBL trends and with search
criteria involving Latin terms for articles on Comenian concepts. Translations from Latin to English have been carried out by one of the authors. A frequently used technique in the study has been backward searches on interesting references. Vom Brocke et al. (2009) defined a backward search as “reviewing older literature cited in the articles yielded from the keyword search”.

Themes that were found in the analysis have been grouped in to categories built up with ideas both from the Comenius era and from contemporary GBL theory. New and older ideas have been compared to sort out similarities and differences. Finally, the interdependencies between categories have been analysed and discussed. A general inclusion criterion has been to choose articles that points out themes that unites 17th century ideas with contemporary trends. For that reason there is an emphasis on similarities rather than on differences.

4. Findings and discussions

Facilitas – Flow

The sixth point in Comenius’s scheme clearly refers back to his general didactical principles. What he calls “facility” is something that both makes games enjoyable and learning easier in that particular way of learning, “purely through examples and imitation, with no general rules or only a few, occasionally interspersed”. (Comenius, 1657B, [xvi].) Comenius elevates games/play from an insignificant and vain pastime to an expression of that highest level of that human excellence, of which Renaissance philosophy was fond of speaking. Comenius’s motto was “if there is no coercion, everything flows freely” (e.g. Comenius, 1657B, title page). This also illustrates that Comenius’s ludology was central to his didactics, not a peripheral interest.

The idea that games are motivating experienced a renaissance in the 1980s when Thomas Malone (1981) analysed digital games to find out what it was in the game design that made them engaging. His main findings consisted of three key components: challenge, curiosity and fantasy. Mark Lepper is another researcher that investigated how more general playing could stimulate learning and motivation (Lepper, 1975). Curiosity and challenge were also key to Lepper’s research (1988). Based on common findings Lepper and Malone combined their ideas to ‘The taxonomy of intrinsic motivation’. A taxonomy with two levels, the level of internal motivation and the level of interpersonal motivation. Main components in the level of internal motivation are challenge, curiosity, control and fantasy. Identified components in the level of interpersonal motivation are cooperation and recognition (Malone & Lepper, 1987).

The idea that studies in themselves should be enjoyable recurs in Comenius’s works. When arguing that harsh discipline is counterproductive, one of his reasons is that if the teacher teaches with an appropriate method, studies should be “enticing” (“illecebrae”) in themselves and therefore pull the students in by their “own charm” or “pleasantness” (“dulcedinéque súa”). (Comenius, 1657A:161) What is described in this passage seems remarkably like the concept of intrinsic motivation, which is also often seen as one of the main benefits of GBL.

Another motivational concept based on challenge and frequently involved in GBL research is the flow theory (Wang & Chen, 2010; Admiraal et al., 2011; Hamari, 2016). Flow as defined by Mihaly Csikszentmihalyi (1990), is a state of deep absorption as when humans are focused playing a game or involved in other activities that are joyful and intrinsically motivational. The flow theory is based on the reciprocal relationship between challenges and proficiency that keep the player in the flow channel between boredom and anxiety. In the context of gaming the gamer gets bored when the game is not challenging enough, and anxious when the challenges are too tough. A concept with several similarities to the Comenian idea of facilitas, and mirrored by his discussion of competition (mentioned above).

The flipped classroom

Comenius advocated a reform of the school day (shortened to 4 hours, with 4 hours of private exercises; Comenius, 1657A:84), and perhaps a form of “flipped classroom”, as he literally wished pupils to take the teacher’s role (Comenius, 1657A:97-98).
A strong trend in contemporary didactics is the concept of the flipped classroom, a kind of blended learning with a strong emphasis on the use of digital tools. Two tested blends close to each other are the game-based flip of the classroom (Klein, 2017) and the gamified flip of the classroom (Hung, 2018). This resembles Comenius idea about a school day that should not be longer than four hours, divided into two hours sessions. The time in between was recommended to be spent on preparation, play and to explore nature.

**War games**

The first games and simulations for educational purposes were war games (Freitas, 2006; Moore, 2015), which partly might explain the wide variety of ‘shoot them up games’ (Freitas, 2006). In the current rich plethora of digital games, shooter games are a remarkable high percentage with high status games with highly dedicated players. One example is Counter-Strike, a first-person shooter game played with and against real persons over a network. More or less professional players compete in Counter-Strike teams in global competitions with considerable prize money.

It has also been discussed if Counter-Strike enhances the cognitive abilities and could be seen as a learning game (Kearney, 2005). Comenius’s vision was more one of a peaceful utopia with enlightened citizens living in harmony. The motto of Comenius’s collected pedagogical works is “without violence, everything would flow spontaneously” (“Omnia Sponte Fluant: Absit Violentia Rebus”). However, as we have seen, he did value competition highly. Comenius would probably have enjoyed the current rich plethora of digital games, but certainly not shooting games like Counter-Strike.

**Direct vision**

A concept that seems hard to find a counterpart to in contemporary GBL is how Comenius laid great stress on the senses in teaching and learning, most of all perhaps, the sense of vision. Learning should come about through “seeing directly” (“directè intueri”), and things should be put “directly in front of us”. (Comenius, 1657A:114-118) Despite the strong use of graphics in contemporary games the originally Epicurean idea of a ‘direct vision’ has not be found in GBL theory. Maybe that computer handled images is more about indirect vision than direct. When it comes to documentary film the Italian filmmaker Roberto Rossellini is inspired by Comenius when he in his book Informazione expains his idea of direct vision as "Images with their naked purity, directly demonstrative, can show us the road to take in order to orient ourselves with the greatest possible knowledge ..." (Brunette, 1996, p. 256)

Finally, at least three previous studies have touched on Comenius in connection with modern GBL. Firstly, Gruber & Freisleben-Teutscher (2015) study GBL in the introductory phase of learning. They briefly mention Comenius as one of a number of forerunners in the GBL field and stress the integration of games in the learning process as a whole as well as the freedom in games which in their view is essential for achieving desired learning outcomes. Secondly, Kapoun (2016) explores “educaching” – an educational game of geocaching. In so doing Kapoun also makes reference to Comenius, and more specifically to Schola Ludus. However, the author views Comenius’s concept mainly as one of “dramatizing the subject matter” (p. 57), which we feel is a much too narrow interpretation. Thirdly, the book on didactic games for mathematics by Vankůš (2012) is an interesting and concrete example of using Comenian ideas in a modern context.

In our view, Comenius’s position on GBL is most closely aligned with contemporary ideas of intrinsic motivation. Comenius wished that the learning process itself should take the form of a game, because we only learn well when we engage in learning activities willingly and spontaneously. Games fit this description perfectly: they are their own motivation, and it is, in Comenius’s view, part of the very definition of a game that they are free, and spontaneous. His succinct phrases, “Nemo ludit coactus” (“no-one plays if, or because, s/he is forced to do so”), and “omnia sponte fluent absit violentia rebus” (“everything flows freely if violence is absent”) describes this very well. It is in the nature of games that we engage in them freely and willingly, and thus the game is the best model for efficient learning.
Conclusion

The results of our inquiry have, first of all, demonstrated that the concept of GBL is indeed appropriate when discussing Comenius’s didactics. That learning should be like a game is a fundamental and recurring theme in his thought, and the term cannot be described as an anachronism in his case. We also believe that his views give a valuable contribution to modern discussions on how GBL is to be best practised.

Comenius could for several reasons be seen as the father of modern didactics. In a time when students were seen as passive receivers, he suggested didactic settings where students instead should be active creators of knowledge. This resembles the view of a child's experimental reasoning that was presented by Jean Piaget in the 1950s, in a time when students still had the role of passive vessels to be filled with information (Inhelder & Piaget, 1955). As pointed out by Jean Piaget in his studies of John Amos Comenius it might not be without risks to: “treat an author of 300 years ago as modern and claim to find in him the origins of contemporary or recent trends of thought” (Piaget, 1993, p 173). It has not been our intention to trace origins in this way. As has already been shown, Comenius's arguments were formed in the context of 17th century educational theory and practice. However, this does not mean that the issues he encountered were not also to a large extent universal: how to create conditions for efficient learning.

Our findings indicate several similarities between the Comenian idea on a Schola ludus and contemporary streams in GBL research. The comparison shows that Comenius took distinct positions on many of the issues discussed in modern GBL. First, Comenius considered games to be conducive to learning, that they provided essential facilitas to the learning process. His discussion of this is strongly reminiscent of the modern concepts of “flow” and “intrinsic motivation” in particular. Comenius clearly saw games as a means of activating students. In view of that, it is natural that he also wished pupils to always both learn and teach, as they will inevitably learn more by teaching others. This is at least in part comparable to the modern concept of “flipped classroom”, especially as Comenius, like modern educators, advocated this for didactical reasons (not merely for reasons of economy).

It is difficult to place Comenius on the learning game continuum (given in Figure. 1). He wished the serious and the fun to be combined, not only as means and end (teaching serious content in a fun way). We have shown that games are more central to his philosophy and that he regarded games or play as natural. This he had in common with several later thinkers, such as Schiller and Huizinga. Typically for early modern philosophy, nature was also a normative concept in Comenius thought: because play and games are natural to mankind, we should engage in them. Authors’ recommendation is to experiment with modern implementations of the Comenian concepts of playing and gaming with a serious foundation.

5. Future work

This normative view of human nature leads on to a final, critical, point. Comenius was after all not a modern philosopher of education. He was not an adherent of the modern scientific methods, which were only just being developed by contemporaries (such as Francis Bacon and René Descartes). This means that while he did develop his theories at least to some extent on the basis of his own experiences as a teacher, he did not evaluate his supposedly infallible method systematically. He did not conduct empirical studies of different educational methods. In our view, it is evident that his theories remain relevant and thought-provoking. It remains to evaluate them scientifically and study their effectiveness in the context of the modern classroom.

References


