How new media has enabled the harnessing of implicit learning

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Abstract:
The term of implicit learning is still subject to controversy. "At least a dozen different definitions have been offered in the field" (Frensch & Rünger, 2003 p.13). While some scholars consider it downright inexistent (see Chun & Jiang, 1998), many others are trying to identify how we seem to acquire knowledge in absence of conscious awareness. Since it manifests in complex environments where patterns can be intuitively observed and interiorized by the learner, various forms of new media and particularly digital games seem to be the best method of investigating its efficiency. This paper aims to demonstrate how strategic use of new media, combined with digital games can facilitate the emergence of unconscious knowledge acquisition and how some of the knowledge acquired in such manner is better stored in memory and translated into skill.

Keywords: implicit learning, explicit learning, new media, big G games**.**

We are all implicit learners and this becomes more obvious when looking at how we acquired our basic skills: We've learned to walk, talk, eat and later on even climb stairs and swing, mostly without being told on how these skills work. We are successfully exploiting laws of physics long before we know they even exist, let alone how they work. Skiers, swimmers, weightlifters and other athletes have their whole careers revolving around laws of physics they can't define or make calculations on. Nonetheless, they seem to have a thorough understanding of how these work. We learn pretty early on that submerging an object in water displaces it, and that its mass, shape, and material will determine how much water it displaces, whether the object will float or sink and all that knowledge is stored in meaningful ways way before we know anything of physics as a field of knowledge.

But let us assume that we get instructed or we explicitly explore how these laws work when we experiment with the world around us. Still, there are many sets of rules we learn and understand at various levels without paying too much attention to them or explicitly exploring their mechanics, partly because we cannot safely do it, and partly

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because there is simply no need to. A good example would be human interaction, and in a broader sense, the social environment. For instance, by the time we reach teenage years we know that the opposite sex represents a potential mate, and we start interacting with it in a way we never did before. Flirting, starting and ending conversations, behaving in a group and earning member status, its internal and external dynamics, relating to several groups in various contexts, etc. All the undoubtedly valuable skills derived from social activities are acquired implicitly. Some do better some do worse based on talent, personality, character, experience etc. Nonetheless, aside from general rules uncovered by social psychologists which can be found in handbooks, nobody is teaching us how to do it, and even if we examine events, we map our own rules according to the associations we have the talent and wits to make. And since our social challenges are deeply tied to our personal characteristics and context, general rules or the shared experience of others will be of little to no help.

Moreover, we almost never explicitly experiment freely with our social life since it is either dangerous – failure can result in damage or loss of friends, groups, status etc. – or impossible – you don't get to replay and practice your social experience in that particular context ever again. What we do instead is assume outcomes and try, to the best of our abilities, to observe and confirm or infirm our hypothesis. While this might be defined as explicit learning since we intentionally investigate events or people, the basis for the emergence of the hypotheses are rather merely the result of instantiated, incidental observation, thus not explicitly learned. Most of us simply *go with the flow*, have a *gut feeling* without further examining and rather *just knowing* how things will turn out.

This particular type of knowledge or skill which seems to *just exist*, without us being able to pick up where it came from is what I refer to as implicitly learned.

Working definition:

In absence of a widely-accepted, comprehensive definition of implicit learning, we will refer to it simply as *learning which occurs unconsciously and unintentionally*. This implies that the learning goal is not the acquirement of knowledge or development of a specific skill/set of skills. Since learning occurs whenever we are exposed to environmental stimuli that can be absorbed, in the sense that they either act directly upon one or multiple receptors or manifest their effects in such way that their results can be perceived, direct action aimed at learning cannot be an intrinsic condition. From this standpoint, we can consider most empirical and experiential learning as implicit since its goal is seldom achieving a certain level of skill or acquiring knowledge but rather solving problems, reaching conclusions, developing a product and so on.

Let us take the example of a traumatic event. It is incidental, rememberedunintentionally, and the resulting trauma is, in fact, an experience we memorized. In most cases though, the triggering events will stay with us and will have an impact on how we behave or conduct our lives from that point on, or until the memory slowly fades. For better or worse, the *knowledge* of the triggering events will stay with us and since we actively use the information to conduct our lives, it falls under what I call here learning.

With this last example, the connections between implicit learning and implicit memory become obvious, and since implicit memory is known to work unconsciously (Lewandowsky, 2014), at least some of the information stored within *must* also be learned unconsciously. I use the term *must*, since the multitude of our needs implies that some must be unconscious, otherwise most cognitive resources would be allocated to satisfy them every couple of seconds. For instance, the needs which are addressed immediately and trigger unconsciously execution: like the sudden change in body pose when the previous becomes uncomfortable or antagonistic poses which relieve pain and are unconsciously executed, that is, without analyzing or investigating how they work and why we feel better or relieved when we execute them, or even realizing we executed them.

Whether or not we learn the poses and use them whenever needed is not even worth investigating, since it is obvious that we do. If implicit learning would not occur in this manner, we would, for instance, have a small accident and hit our knee on the new desk every time we sit down unless we explicitly and actively invest cognitive resources into learning not to – which we don't.

I would argue that implicit learning does exist, and while a comprehensive classification of its forms would shed light on the matter, learning without express intent to do so occurs in so many ways, that it's nearly impossible to deny its existence. It's always been hard to measure *invisible* things, but when trying to measure implicit learning, on top of the fact that we are measuring parameters of the human mind which are particularly difficult in itself, we are trying to measure something that is invisible even to the conscious mind, until proven otherwise.

The working definition provided implies that the conditions needed for learning to be classified as implicit are:

- The learner has no perceived learning goal, or the learning goal is offset;
- The learner is unaware of – does not perceive – the learned concepts or content;
- The learner is able to make use of the concepts or content learned;
- The learner cannot articulate or explicitly identify what they have learned;

New media and implicit learning:

New media is characterized by interactivity and endless customization that offers immersive consumer experience. From short clips to motion picture, from apps to digital games, new media opens doors that were never there before. Never before in history could we replay and analyze the events on the stage of a theatrical play, unless replayed by the actors which made it another instance altogether. Never before could we immerse in complex simulated environments, test and simulate virtually anything, from the movements of the stars and physics phenomena to macro-social mechanics and emerging markets

In this rich environment, almost any kind of content is only a couple of mouse-click away. And since information and content are customizable, interactive and made to be attractive, learning can and will take place anywhere on the internet since the vast quantity of informational bombardment implies memorization, be it conscious or unconscious. But while memorization can occur unintentionally, so can learning.

Let's start with video material which includes all videos from commercials and short clips to motion pictures and TV series. Remember that annoying commercial which had a song in the background that you couldn't get out of your head for days on end? While the priming effect – widely exploited for marketing purposes – is mainly responsible for the song lingering in your memory (see Minton, Cornwell & Kahle, 2016), what you implicitly learned are the lyrics of the song – if any – of the lead melody at least. Whether or not they will ever be useful depends on the content and/or contexts in which that particular content may be useful. But you are aware of the fact that: a) you know the song, as in you can recognize it; and b) you memorized its lyrics and/or lead melody – and thus, we cannot classify it as implicit knowledge even though it was learned unconsciously and without intent. Instead, what I want to emphasize is that you may also have implicitly learned the internal rules of how commercial videos are engineered which can be very useful when, say, you want to produce your own material. Definitely, the large array of materials you have seen will come in handy, and when constructing your own clip, you will easily identify which components are missing, like a catchy or annoying song, effects, message and so on. This means you know – without knowing you did – the structure and elements of a video clip and this set of information meet all the requirements to be considered implicit knowledge according to the above-mentioned working definition.

Learning from digital apps works the same way. Structurally, they are but layers on layers of functionality: from operating modes to instances – of the same element, of the environment, of the rules set, options, etc. – interconnected by complex sets of rules and conditions. This much is obvious to the digital native – but how? They hardly learn about it, especially at the ages they start using them. Yet, these rules are clear to them, and even in the absence of the notion, based only on its corresponding abstract representation, they are classified and mapped, in other words, mentally operated on.

Most digital natives will know the algorithms required in order to boot up and play a game or navigate the internet on a computer, use smartphones or tablets and even some apps, and better yet, even type relevant words on a keyboard to fill in a search query, long before they've learned how to read (see Miller & Warschauer, 2014). Seldom had any parent or peer instructed them on how computers work, how the inner rules of the operating system require them to launch an application and navigate through the main menu before being able to reach the content they were searching for, turn up or down the sound or luminescence. And even more seldom had any of them experienced to see how the operating system actually works. Incidentally, through exposure, they *picked up* these rules as they went: they are definitely unaware they've learned them, unable to articulate them, most certainly never made a goal out of learning how they work, but still, know how to use them in order to satisfy their needs.

Sometimes, the satisfaction of user needs may require investigation and explicit inquiry on how to obtain the desired outcome, like the tuning of luminescence or sound for instance, and that may well be considered explicit learning. Still, the generalization that derives from that instance where a particular icon with a particular symbol, placed under a particular panel of options, is still unconscious, since normality is set on the spot, at first instance, without the knowledge of the user. When faced with the same need but in some other software, the user will search for the option since he knows such option exists and *assumesby default* that this option must exist in other software as well. Like most things though, at very young ages, using digital devices and witnessing the effects of options are accidental or pure exploratory.

Obviously, this line of argumentation is correct as long as we don't consider a child's intrinsic curiosity in itself an explicit endeavor in learning which would make learning – of virtually everything – and not the satisfaction of needs – in this case, curiosity – the very goal of the child's behavior.

Most software developers when advertising their products highlight the *user-friendly* and/or *intuitive* user interface. Since implicit learning is based on intuition which in turn is based on familiarity with patterns, a more intuitive user interface only means it facilitates learning and habituation without further explanations, faster. By now, familiarity relates obviously more to other software and their user interfaces rather than reality. But menus are still simulating drawers in a cabinet, and many options still use sliders, radio buttons and other virtual elements which relate to representations of real things from the real world which we are exposed to in our everyday life.

Digital games are similar to digital apps but they hide implicit knowledge at a much deeper level and can develop full competencies, that is, with content acquisition, development of skills and shaping of attitudes. However, from this standpoint, at this level of generalization, there are two types of digital games (Gee, 2011): the *Big G games* and *Small G games*. And while both can develop full-blown competencies, the kind of competencies they develop, their depth and complexity are different by a large margin.

For instance, Pinball and Tetris can both be considered digital games since they are digital applications operable through a digital terminal, are intrinsically interactive – which means they require sustained input in order to work and offer feedback – and are meant to entertain. However, they cannot be compared to complex strategy or tactical games, RPGs (role play games), FPSs (first person shooter games) or MMOs (massively multiplayer, online games).

While small G games can only develop or train some skills like reflexes, eye-hand coordination and some strategic handling of momentum – in Pinball – or visual-spatial orientation, strategic placement of primitive shapes and thinking under pressure – for Tetris – big G games develop a much wider set of skills, they include content and stimulate attitudes simultaneously.

One may say that strategic games are all about strategy, and that is correct. It's just that the more complex ones are never *only* about strategy and even if they were, strategy comes in many different shapes and sizes: one must strategize economy, production, population, expansion, military tactics, and strategy, etc., and all these come at least in two sizes: micro and macro-management. Each of these skills is needed to interact in complex ways with a vast variety of content: units, buildings, geography and various other elements, and each of these have characteristics, parameters, and functionality. In addition, the content must be set in a world which will serve as a context. This additionally implies the existence of history, characters, and events, which ensure the purpose of the player's action and drive. All of the content interacts through complex mechanics, where sets of rules become interdependent and conditioned by either the player or the game environment.

Just like skills, various attitudes – as components of any competence – can be developed by gaming experience: ignorance, rashness or thoughtlessness, laziness and lack of perseverance or superficially interpretation of information tend to be taxing, and when it comes to games that involve multiple players, the variety of attitudes that can be learned are as many as they are in any environment where multiple individuals have common and/or conflicting goals.

Big G games as virtually cleverly simulated worlds in which the player is an actor, an entity, or even both, in various instances. But while the above-mentioned skills and content are virtually the second level of interaction, the first level of interaction is the actual user interaction: the user's input skill which has to be learned in order to efficiently operate in the game world. Only after acquiring the necessary input skills can a user immerse into the world, explore and play and sometimes even exploit the game rules.

I would argue that most of the above-mentioned skills and content are learned implicitly since the goal of the learner is basically to have fun. It is true that in the case of digital games, having fun is somewhat the same as learning, but it is only so in the sense that when watching a movie, one wants to *learn* what happened to a character or what will happen next. Still, hardly anyone would classify watching a movie as a learning experience, even though that's what it virtually is. And this mismatch between what *learning* means when comparing explicit learning with implicit learning is caused by the perception of the learner. For as long as learning is passive, not perceived as learning, it feels effortless, and explicit learning rarely feels so.

When playing a Big G game, just like when watching a movie, the player's drive is oriented towards the next goal – usually the mission objective or quest at hand. Unlike movies, digital games add layer upon layer of drives, acting as pull factors for the player to continue playing. The missions or quests reveal new locations, characters, interactions; usually unfold multiple story-lines coating the main storyline, give rewards upon completion which add to the complexity of the game: either new abilities or equipment for the hero, new units or structures for the commander to work with etc. Uncovering the story goes hand-in-hand with the development of the character the user is projecting his identity on, which enables, even more,combinations and open up more possibilities. In all ways, a cleverly designed game has an optimal learning curve for the target audience, and it is usually relatively late in the progression of the game that the user needs to explicitly learn anything – by searching the internet which may feel like researching and may be less fun.

Mostgamesdesignrevolves around a system that introduces new information – even the basics – in a way that renders learning effortless and makes it fun, most times cleverly integrated into the story in form of a quest or mission. And while the player is explicitly told what to do in this manner, the skills players need for the completion of the task at hand were introduced before, in other ways which seemed meaningful.

As the player progresses, tasks start requiring better-polished skills and are more complex. But since the previously learned skills' iteration has been ensured by game design, by the time they become complex, the user's ability to use them appropriately is proportionally developed, and even if previous strategies fail at certain points – which are again intended by game design – the player has enough understanding of the game world by now to know they need to change tactics and experiment.

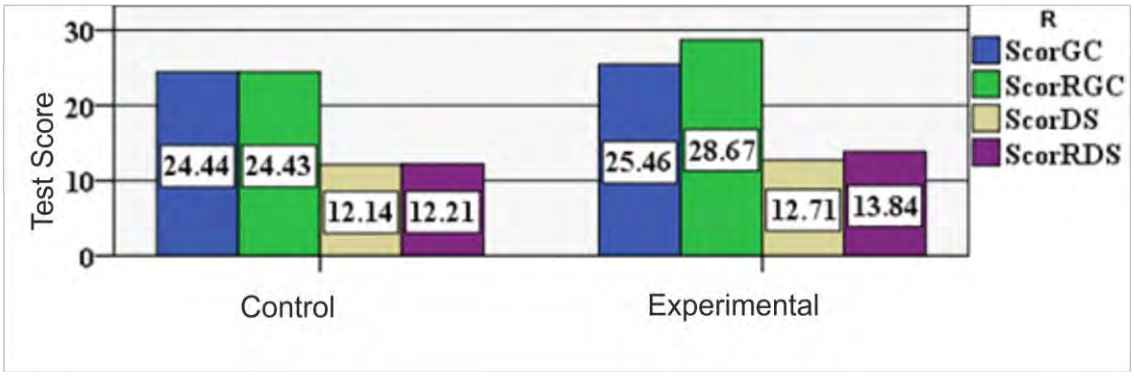
Considering the content approached by today's digital games: from history (see Crusader Kings series, Total War series and Age of Empires series) and fiction/culture (see The Witcher series, Mass Effect series, Dragon Age series) to philosophy (see Bioshock series, Soma, The Talos Principle), the informational acquisition contained is far from useless or non-transferable, especially since the emergence characteristic to digital games is deeper and more personal than that of motion pictures or other types of media. The player projected on the character stands to lose or win, make choices, act according to own feelings and alter the course of events.

Digital games and other types of media can be successfully molded into instructional designs. By careful planning, strategic recommendation of media intake – specific clips, motion pictures and digital games – and with the educator acting merely as a mediator, delivering short lectures binding the skills and knowledge implicitly acquired by the learner, abilities, and competencies can be developed, complex concepts can be acquired, and even attitudes can be stimulated.

Harnessing new media's implicit learning potential

A mixed investigative study conducted on 271 high-school Romanian students from four high-schools of both genders, aged 16-18 following a two-month formative intervention plan using short video clips, commercial digital games and artistic motion pictures shows higher post-intervention scores in digital literacy (Scor DS/RDS) and critical thinking (Scor GC/RGC) for the experimental group in comparison with the control group as shown in figure 1.

Figure 1 – Test Scores (RDS/RGC represent post-intervention testing session scores)



The participation variable is strongly correlated with the retest scores for both critical thinking r=.43, p<.01 and digital literacy r=.22, p<.01 tests as shown in Table 1.

Table 1 – Correlations between participation and the second instance of testing

		Participated	ScorRGC	ScorRDS
Participated	Pearson Correlation	1	**,430****	**,227****
	Sig. (2-tailed)		,000	,000
	N	271	271	271

**. Correlation is significant at the 0.01 level (2-tailed).

The formative intervention consisted of a simple online group on a social media website. On this group, various media materials were strategically posted by the educator and discussions regarding them were stimulated.

Digital media was strategically selected to tackle subjects of interest to the pupils at the time in such way as to not directly target the skills that were aimed at developing. This allows for a greater flexibility in selecting media content according to the pupils' needs of information, interests or affinities while the educator is pursuing his own formative agenda.

The program was implemented for two months, and the educator has acted only as a moderator, posting comments and short teasers, challenges and eventually, explanations on why that media was selected and what it was meant to do. This tactic of delayed explanation was used to create learning experiences that worked as epiphanies or what I would call *eureka* experiences. Attending the program, consuming the media or participating in conversations was never mandatory. After the end of the experiment, the participants were asked to fill in a feedback form on how they felt about the intervention program. All participants reported they felt *going on the platform was a waste of time or stole their free time* were eliminated from study results, since the aim of the intervention was to harness implicit learning, thus effortless, unperceived, unconscious learning, virtually simulating spontaneous media intake which occurs naturally among high-school aged students.

The study was aimed at innovating simple and accessible ways in which educators can stimulate the acquiring of knowledge without increasing the perceived workload of the students. The resulting formative program is a flexible instructional model that can be used by educators to form a vast variety of competencies for which relevant – both useful in addressing the target skills or content and enjoyable by the educator – media material can be identified.

Since homework is considered particularly unpleasant by most students, proper implementation of such programs by either an educator or group of educators could reduce or even eliminate student perceived home workload while actually learning more, and potentially increase educator's performance, since more time can be allocated to discuss concepts and develop transferable skills in class, instead of delivering content or iterating exercises.

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