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# Yet to meet the Goal: Goal Based Scenarios' Rejection in K-12 and what may Shape its Future.

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For as long as schools have been open, passionate individuals, such as Plato and Dewey, have been applying various reformations to its structure (Margetson, 1994). It may be claimed that a school system represents its surrounding society's contentions about the purpose and process for educating children. As such, reform within the classroom often requires urging from outside forces residing in the society (Margetson, 1994). Roger Schank hoped to utilize technology based learning designs to follow the historic path of successful reformers of the education system. This experienced researcher in the field of artificial intelligence claims to be as determined to prevent the human race from becoming obtuse as he is motivated to make machines more intelligent (Freedman, 1994). Schank's theories introduce a revolutionary view on how memory is stored and retrieved; he complements his assertions with impressive designs he labels 'Goal Based Scenarios' (GBS).

Goal Based learning has claims to create a refreshing atmosphere of creativity, discovery, and exploration without creating an unreasonable excess of extra responsibilities and commitment from the school system. This software represents one of his fundamental interests in recreating natural learning in a semi-structured but exploratory environment with expert support only a button click away (Schank, 1995). Although many of his ideas about learning continue to be quite revolutionary, Goal Based Scenarios kept its educational footing mainly in the corporate world and was very minimally introduced to the K-12 grades. Through an analysis of the fundamental principles which Schank held about learning, and an evaluation of the Goal Based software and track record of Goal Based Scenarios, this paper will seek to address why Goal Based Scenarios has not successfully been implemented in K-12 education and how this may change in the future. As well, this tradition will be evaluated holistically to understand what

general lessons it may offer to educational technologists about effective learning in today's K-12 classrooms.

## Assertions about learning and Goal Based Scenarios:

In Schank's book Engines for Education, he presents strong notions against the current state of the education system (1995). He contends that schools are unsuccessful at assisting children in thinking independently as adults; they eliminate much of children's natural desire to understand the world by providing unnecessary confinements to exploration and by rewarding conformity. As all individuals are successful achievers when they practice 'learning by doing' (with real experiences) in an area of which they have intrinsic motivation, the school system should allow for sufficient flexibility in their curriculum that students take ownership for their learning (Schank, 1995). Unfortunately, in the current state of schools students have very little input into their educational experience and are at the mercy of their personal teacher shared between many other peers with different personal desires.

Schank understands the seriousness of passive learning and having such a high ratio of 'expert' (or knowledge provider) to 'novice' (or knowledge engager). To address both of these major concerns, he produced Goal Based Scenarios using advanced computer technology for the times. Schank contends that this advancement in technology enables the desirable ratio of expert to novice to exist (1:1). Not only does this dramatically improve the ratio in the students' favour, but they are now being exposed to real-world experts in the subject area of study opposed to the teacher taking the position of expert (Schank, 1995). This subsequently allows teachers to make more efficient use of their time, according to Schank, by facilitating the exposure of expert knowledge to their students, encouraging them, and engaging in classroom management.

In Goal Based Scenarios, students are given a task to complete which requires a certain level of understanding and expertise in the given topic area of the software. The student then is able to engage in the program however he pleases to collect and sort relevant evidence, make decisions, and reflect on any problems that arise. In addition, the software utilizes real world experts to provide timed assistance for the various subsets of the goal that the students are given when they first begin the scenario. As such, this technology encourages students to engage in learning more naturally- by exploration and discovery. What coincides with this are inevitable failures, followed by clear opportunities to receive expert advice in the face of their discouragement. However, unlike in the current school system where failure is looked upon negatively and corrections are too often 'spoon fed', experts give students advice by telling stories which hold great similarities to their current problem. In these stories lie solutions; if the students apply the knowledge shared in the expert's story to their current problem then they will be successful in the scenario's challenge (Schank, 1995).

Schank specifically structured the software around this form of 'storytelling' to capitalize on the students' ability to transfer their new understanding to other life situations and uses of that knowledge. Schank's experience as a researcher for artificial intelligence gave him many years of study to develop theories on how the human mind holds long term memory, and more importantly, retrieves those stores (Freedman, 1994). He offered a revolutionary view on this concept by claiming that we store information as stories in our memory; when a similar situation arises, we search our memory index for relevant stories to assist us. When we believe that a certain outcome is destined to occur and then something different happens, we have experienced "expectation failure" and a new story will be added to our understanding of that concept which was just challenged. For example, if every silent movie resolved with the young woman tied to

the railway tracks being rescued by her hero, the next time we began watching a silent movie we would expect this rescue to happen. If this particular time, the hero failed to rescue the young damsel resulting in her death, we would have experienced expectation failure and this would add a new story about silent movies to our memory. Each subsequent time we watched a silent movie, we would now remember that the ending may not always follow our previously understood pattern of rescue. According to Schank, expectation failure is the most efficient way to gain new understanding because the memory's story is robust, well indexed, and causes changes to our previous understanding.

Schank encompassed this belief about how memory works in his assumptions about what a valuable learning outcome is. According to Schank, learning information has little value if it isn't indexed efficiently as stories, and one concept termed "expectation failure" provides the most effective index for our memories (1995). Therefore, if a learning tool is designed with this assumption in mind, it will provide opportunities for expectation failure to occur such that these stories can be indexed. Goal Based Scenarios were also designed to accommodate this natural learning process; a well designed scenario would lead to common pitfalls which would support expectation failure to occur (Schank, 1995). A major advantage of simulation based learning (using goal based scenarios) over traditional methods is that there is a much greater likelihood of coming across the memory story's from processes such as expectation failure. Therefore, the knowledge gained from engaging, failing, and adjusting our understanding in scenarios is more likely to be transferred to other relevant situations. The issue of transfer has long been a complaint for educational researchers- modern classrooms are challenged as producing a very minimal amount of knowledge transfer in their students. Schank's revolutionary view of how memory is stored and retrieved along with his designs for learning may reduce the challenge of

transfer for educators in all educational settings. Although his theories are logical explanations of how we understand our world, it has yet to be adequately supported by much scientific evidence.

## Comparison to other traditions:

An additional way to understand the goals, strengths and weaknesses of any specific design is to contrast it with other traditions. Unlike GBS's, many other traditions have conducted research in support of having more natural forms of learning in the classroom to aid motivation and transfer. One that is similar to GBS in these characteristics is Anchored Instruction in which 15 minute descriptive videos are watched about a character named 'Jasper' (Cognition and Technology Group at Vanderbilt., 1992). In these mathematical videos, the main character becomes involved in a problem that needs to be solved using logical reasoning and mathematical manipulations (all necessary information is provided in the video). The designers of this K-12 classroom tool believe that high teacher involvement in the research and reformation of their designs is fundamentally important (Cognition and Technology Group at Vanderbilt., 1992). Schank did not conduct much research on whether his designs were effective at aiding student understanding, and he had little interest in pleasing current educators by allowing their input. His primary concern was on his principle beliefs about how we acquire and utilize new information (through story indexing and expectation failure). In addition, Schank would not have been content with the length of Anchored Instruction's videos. While both traditions utilize a video format to provide a sense of authenticity to the learning environment (and believe that this would aid the transfer of knowledge), Schank believes in using compact, expert knowledge in short clips. He asserts that the most efficient method to retrieve information from stories is when they are precise and from expert knowledge opposed to drawn out interpretive information from the Jasper series.

Next to Schank's beliefs on how knowledge is retrieved as indexed stories comes his belief that people should be naturally motivated to learn-at least, some things. Whichever interests a students has, she should pursue deep understanding by utilizing experts in her fields of interests (Schank, 1995). Another tradition which contends that learning should be natural and interest driven is from Papert's programming technology "LOGO". LOGO allows students to become in control of their learning by mastering a programming language that moves a small turtle on their computer screen and follows his movements with lines. Students are encouraged to create geometric designs through a process of exploration and "de-bugging" (noticing and correcting errors) (Papert, 1980). While Schank's GBS allow exploration, the software is designed for specific expert advice to be accessible at key points (often when expectation failure is believed to occur); this timed assistance reduces the frustration students experience when they are unable to accomplish their intended goal.

## Goal Based Scenarios and K-12 schools:

From the perspective that Goal Based Scenarios have many positive options to offer grade school teachers and their students, why have Schank's Scenarios only kept their footing in the corporate world and were never particularly successful in the K-12 system? Although this is a complicated question, the main challenges against the implementation of this software could essentially be discussed as three interrelated hurdles. Firstly, this program was ahead of common development in the area of technology. Although this has advantages, the result of needing expensive equipment to run the software was a major hurdle for schools. Initially, Goal Based Scenarios were designed to be attractive to clients in the corporate world; the funding necessary for the development of the software and its company was supposed to draw on this client base of businesses teaching their employees through the "learning by doing" software. After Goal Based

Scenarios had sufficient funds to become a more developed program, Schank apparently strongly intended on revolutionizing the way that children learn in the K-12 system. At this time, it was still infeasible for schools to afford the equipment necessary to teach a class using Goal Based Scenarios. Schank acknowledges that economics have definitely played a role in the development of Goal Based Scenarios and agrees that if his ideas were introduced now that the economics are more in the software's favor (along with his motivational literature) then the current state of Goal Based Scenarios may look very different (Personal communication, 2009). The current cost for the technology required to run the program would enable Schank's dream of having an expert/novice ratio of 1:1, and if this software was redesigned, it could have great potential to awaken its benign dream of transforming the K-12 educational experience.

The second main hurdle against a readily acceptance of Goal Based Scenarios in our grade school classrooms is the resistance from educators and school districts. Most educational technologists introduce their concepts with the same claims that education needs drastic change and that their design will create solutions for modern education (Bennett, Maton, & Kervin, 2008). This drastic change is far from being attained over night, and involves a delicate hierarchy of passionate individuals to produce anything. Initially, creating software that is diverse enough for today's multicultural classrooms and yet specific enough to support the community's focused curriculum is difficult for the software designer. At the next level, implementing any new system into a school district is expensive, time consuming, and requires ongoing support systems and technological training for the software to be used effectively (Meyer, Steuck, Miller, Pesthy, & Redmon, 1999). Further along comes the need for teachers to willingly adopt the new program and teaching style to accommodate it, as well as for the students and the parents to actively

participate. Resistance met at any one of these levels poses a problem to introducing technological advances into any school.

To begin discussing the third relevant hurdle against adopting Goal Based Scenarios in the K-12 classrooms, it needs to be understood that research is a vital component to any claim (Bennett, Maton, & Kervin, 2008). Schank held many beliefs on the value of learning and the transfer of understanding; he designed software around these beliefs. While his ideas may still be incredibly valuable, they lack solid scientific research to support his claims about how we store and retrieve memory and the best learning design to accommodate this process. In addition, even if there was an abundance of research that supported Schank's claims, there would still lack evaluation of Goal Based Scenarios as actually facilitating this desired effect in its users. That is, where is the evidence to suggest that using Goal Based Scenarios helps students learn and transfer their knowledge better? The company responsible for creating Goal Based Scenarios for their corporate clients was by no means lacking financially and could have afforded to produce the scholarly literature necessary to support their claims. In fact, Schank's employed researcher Richard Beckwith was the in-house evaluator who was rarely allowed to do the studies he designed to evaluate Goal Based Scenarios (Personal communications with O'Neill, 2009). Apparently Schank was not convinced that well designed, scientific research would be a necessity for Goal Based Scenarios to become active in the K-12 grades.

None the less, GBS were a sought after teaching device for many established businesses in the corporate world (Freedman, 1994; Foster, 1994, 1996). Although changing companies many times during his career as a software developer, Schank never had a dry period where he was seeking out clients. Although there may be a developmental difference between how adults come to understand and apply knowledge and how children do, Goal Based Scenarios must have

been successful for teaching adults as many companies continued to request the software at an expensive price. Unfortunately for the sake of introducing the software into K-12 classrooms now, much of the research completed by companies (progress reviews for example) are unavailable to the public and may not be applicable to teaching children. This private realm of research is not sufficient to convince districts and educators that Goal Based Scenarios may be successful in their younger classrooms. It could easily be understood that school districts were not prepared to spend any amount of time, energy, and resources on revolutionizing their classroom with a generally untested program that just seems to get fantastic results in the corporate world (although, even these results are mostly unknown).

Future if Goal Based Scenarios made adjustments:

By analyzing those three major hurdles hindering Goal Based Scenarios from entering in the K-12 classrooms, it is interesting to note that these may be unstable issues capable of change. With aggressive counter attacks by developers of GBS and passionate educators, it may be feasible to see GBS (or software similar in structure) in future K-12 classrooms. The role of economics has moved in favour of GBS; the technology required to utilize this software is now affordable for classrooms. In fact, computers have already taken great strides into the K-12 classrooms, and educational researchers predict that this presence will only strengthen in the coming years (Kozma, 2003; Means & Olson, 1995). While technological advancements continue to be faced with little acceptance by school districts and teachers, GBS could be re packaged in a more appealing fashion for the current education system to adapt. Revolutionizing change with a single product is incredibly unlikely. Rather, these software developers can focus on moving education forward by introducing GBS as a supportive framework for teaching concepts with learning by doing. Instead of demanding the maximum usage of the software (it

replacing traditional teaching methods and the curriculum), GBS could be designed to support the existing structures by exposing students to current curriculum in this advanced format.

Schank failed to consider utilizing Goal Based Scenarios to support the preexisting education structure; he was attempting to completely replace this 'flawed' system with his appropriate designs for learning. One of his more plausible attempts was discussed in his paper *Every Curriculum Tells a Story* (Schank, 2002). Schank saw an opportunity to design a story-centered curriculum which would encompass the entire grade 12 school year. The senior year of high school was chosen as his entryway into the K-12 grades "since many schools can arrange their required courses so that students complete them all prior to senior year. The SCCs we design would be attractive if they were designed in cooperation with universities and carried the names of those universities as sponsors of the SCC." Unfortunately for Schank, his story-centered curriculum design was not established as widely in the Grade 12 system as he proposed it may.

While some individuals may contend that Schank's ideas will end with his retirement in the field, it is possible for Goal Based Scenarios to become re packaged by other passionate individuals carrying similar ideas about the nature of learning. So while Goal Based Scenarios will most likely continue to stay out of the classroom during Schank's time, it still has potential to be re-introduced as a learning tool (but not the complete education experience) for K-12 grades.

## Lessons for Future Ed. Tech Designs

Much of Goal Based Scenario's previous history can be applied to assist modern educational designs. The three main hurdles which goal based scenarios arguably needs to overcome before being successful in the K-12 classrooms are expensive technology, inadequate

research, and resistance from educators; overcoming these barriers is important for any educational technologist to consider before completing their design. An intricate balance between producing technology which is revolutionary for the times but still able to be run on the classroom's current equipment assists the technology's move into the classrooms from an economic standpoint. GBS's downfall with their state of the art software running only on equipment far too expensive for school districts to afford is an example of a lack of balance serving a disserve economically. Although, Schank organized the production of his company/software such that it was the corporate world that funded the production of the software in its initial stages (making it less expensive for school's to implement). It could be argued that this approach has limitations in spite of the financial benefit. Once GBS were established in the corporate world, an extra challenge to enter into the K-12 domain became formulated, seeing as the design on the software was structured around teaching adults 'hands on' subjects such as business and language. Further, any research conducted on the success of GBS in the corporate world produces little significance to educational researchers for the K-12 years; these younger subjects could be argued to be in a different developmental state and therefore could not be assumed to have the same results (no matter how successful). The amount of appropriate research conducted using GBS in K-12 classrooms is inadequate, and this reduces the software's claims to enhance the learning experience in these environments.

In addition, Goal Based Scenario's failed to dominate the K-12 classroom system as it became an opposition to the current state of education opposed to a tool which assists educators in producing greater learning outcomes. Schank remained faithful to his controversial criticisms of the current condition of the educational system; he presented a sort of 'all or nothing' mentality in regards to desiring GBS as the means for an entire school year (school system) of

learning. He never desired creating software which was easier for a modern teacher to implement in that it covered already established classroom curriculum successfully and supported assessment and tracking of the learning experience. As well, GBS never included any form of formal assessment; in fact, their exploratory design presents a challenge for educators to know how far the student has come in their understanding of the subject using the software. Future educational technologists should consider these important features in their understanding of what makes a good educational design. These additions may have proved useful in assisting Goal Based Scenarios' plunge into the K-12 classroom system.

In conclusion, Goal Based Scenario's has both great potential and barriers to become an implemented resource in the K-12 classrooms. While an opportunity to replace the current educational system with a series of GBS will likely never exist, passionate individuals may be able to resurrect the ideologies behind the software and re design Schank's notions for learning as a tool which would fit into the current classrooms. Not surprisingly, those with the greatest pull in determining how education should be ran are the ones who are currently making the decisions; these people are not looking for dramatic methods for replacing the current system but rather are looking for aids to improve the current system. Further, these individuals are seeking out cost-effective technologies which have sound research supporting their benefits for student understanding as well as aiding teachers in reducing some of their challenges (such as lack of time). This became evident through a comparative analysis with Anchored Instruction and LOGO and of Goal Based Scenario's track record, showing that future educational technologists should consider economics and adequate research in determining what makes good educational design. Finally, no technology is going to revolutionize the education system-but people who utilize it may. Perhaps a new face of Goal Based Scenarios will assist those people.

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