

# Firmaments of imagination

## – using the Scottish storyline method in early childhood education and care teacher training.

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In 2008 a reorganisation of the preschool teacher education in the university college of Østfold was introduced. As a response to the call for more interdisciplinary teaching, the new curriculum in science (naturfag) and Physical education (fysisk fostring) was based on the Scottish storyline method. As the students in the second year were following the old curriculum, an opportunity to compare traditional teaching with the new storyline method presented itself. This paper studies the difference in knowledge between the two student groups. The storyline had to be adopted to the practicalities in higher education. However, it was necessary to make some adaptations to the storyline method, and these changes probably influenced the success of the storyline. There were two student groups: Control: the students with traditional teaching methods, and Storyline: the students that got the new storyline method. They were tested in a pre/post-test of knowledge by a multiple choice test. In addition the exam grades for the two groups were compared. A questionnaire focusing on motivational factors was performed. The study shows no great difference between the two teaching methods, however, the storyline was not as good in teaching science. The storyline students had higher self confidence in their own abilities, but did not seem to be more intrinsically motivated than the students following traditional lectures.

### Introduction

In Norway, a preschool teacher should have a multidisciplinary approach to early childhood education and care (ECEC) (Kunnskapsdepartementet, 2006). Traditionally, however, the preschool teachers education has consisted of separate academic subjects, such as math, science, languages and arts and crafts. Often it is left to the students to develop the multi-disciplinarity needed. Many teachers education colleges in Norway have tried to alleviate these shortcomings by dividing the teaching into time slots with an interdisciplinary focus, called themed teaching (*temabasert undervisning*). However, in many cases the subjects were still taught separate, even if they had a broad common theme such as «children's culture and communication» (Høgskolen i Oslo, 2007).

The Scottish storyline method was developed as a teaching method for the primary schools in Scotland in 1967 by the Jordanhill College. The method was developed as a practical method to pupil centred learning (Mitchell-Barrett, 2010, p.15). It has been used in primary schools in many countries and in many variations (Eik, 1999), and has had a renaissance in the last part of the 1990-ies and the start of the 2000-ies. When it was introduced it was conceived as a method, and not connected to a certain pedagogical theory. It was conceived more as a collage of best practises for, and teachers experiences in topic based learning. In retrospective it has been linked to several theorists such as Piaget, Dewey, Vygotsky and Bruner. The method is based on constructivism, where the teacher and the pupil construct knowledge together. It is teacher intensive as the teacher must help the pupil to take the next step in his or her learning (Mitchell-Barrett, 2010, p.23).

Danielsen (2005) tested the Scottish Storyline method in the university College of Finnmark in 2001, and reported that storyline was a good method and a flexible way to integrate many subjects (ibid.

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pp. 17). In addition she evaluated the method as relevant for the ECEC-practises found in the ECEC-institutions. An example from Denmark shows how to use storyline as a part of the teaching of practical skills as a part of the nurses training (Hoffmann, 2003). In the Nurses teaching the method has been used as a method of exploring bad nursing habits, a topic that may be difficult to explore with traditional methods. The try-outs have been controversial, and there have been critical voices pointing out that make believe is not the same as practical training, as it has neither patients nor clients and thus is lacking in realism, nor is it seen to be a theoretical study, as the theory chosen is often random and of uncertain value (Vesterdal, 2003).

For readers who want a thorough presentation of the storyline method there are several books on the subject (Creswell, 1997; Eik, 1999; Bell et al., 2007). The main principles of the method as described by Bell (1990):

- It is learner based
- It is an active methodology
- It provides a high degree of motivation
- It provides an extremely powerful structure for both teacher and student
- It links basic skills with the real world
- It provides a forum for dealing with more difficult 'extra' aspects of the curriculum.
- it encourage feelings of mutual respect and between teachers and students
- It gives relevance to the use of up-to-date technology
- It helps teachers provide the correct level of difficulty for each student in the classroom
- It provides many opportunities for cooperative learning
- It fits nicely into language arts/social studies curriculum
- It emphasises the importance of encouraging children to develop their own conceptual method first

As far as we can determine, these principles are not based on research, but is rather a pedagogical manifesto of the benefits that is thought to be the outcome of the method. The principles does not explicitly claim that it provides more knowledge, however, as indicated by the principles *«a forum for dealing with more difficult 'extra' aspects of the curriculum»* and *«It helps teachers provide the correct level of difficulty for each student in the classroom»* there seem to an underlying thought that it can provide students tutoring at individual level, similar to Vygotsky's zone of closest proximity as discussed in Mitchell-Barrett (2010). It also promises higher degree of motivation from the students. There have been few studies on the motivational aspects of the storyline method with the exception of Mitchell-Barrett (2010). She finds the storyline was methodologically based on intrinsically motivation (ibid, p. 169) as described by Ryan and Deci (2000) and others.

By examining each of these strands with reference to the Storyline method, it became clear that aspects of intrinsic motivation were clearly rooted in the design and planning of the Storyline method. All of which verified that Storyline as a method was aligned with the features of intrinsic, not extrinsic motivation. (Mitchell-Barrett, 2010, p.170)

The main focus of this study is to reveal difference in theoretical knowledge in science and physical education after a year of storyline method compared with traditional lecturing, measured with pre and post multiple choice tests and written final exams.

The secondary focus is to assess if the students are more intrinsically motivated for working in ECECs after being taught with the storyline method.

The third focus is to unravel how the implementation of the storyline method evolved in the years after the study took place based on exams results.

## Method

The reorganisation of the teaching at Høgskolen i Østfold caused that the the multidisciplinary subject *PE and Science* was taught at two different levels at the same time, e.g. at the first and second year of ECEC-teacher training. It was deemed unethical to divide the established groups of students, where one group of students followed the storyline method and the other conventional lecturing. Thus the first year students were taught with the storyline method, while the second year students followed traditional lecturing. This led to a quasi experiment where we did not randomise the groups, but used established groups. However, there were no reason to believe that the two groups were different with the exception of their time participating in the preschool teacher education. To confirm the evenness of the two groups a pre-test were performed. This pre-test was made as a knowledge test, hence differences in maturity and study skills which also might impact the outcome could not be measured by this instrument.

First we will describe how the storyline method was adapted in the reorganisation of the preschool teacher education at the university college of Østfold in 2007. The topic for the storyline in this study was; «Running an early childhood education and care institution». The story was initiated during one of the first lectures. The students were grouped in groups of 4 - 6 students, and each group represented an institution. The reason to choose this topic was to make the storyline as relevant as possible to the students, and fit the different subjects taught into the storyline.

Some adaptations were made to make the storyline fit the schedule of the student as other subjects were taught along with the storyline. A typical storyline lasts from one to three weeks and excludes all other teaching (Eik, 1999). This storyline lasted for 10 months with one day each week allocated to the storyline. The storyline group was also given lectures at appropriate intervals to ensure the central theoretical topics in the curriculum were covered. During lectures some time was allocated to sum up the key questions the students had been working on.

Storyline is usually a hands on teaching method, where the teacher submerges in the story with a small number of pupils (Eik, 1999). There were almost 110 participants at the start of this storyline. We divided the students into small base units of 4-6 students to try to keep the storyline groups small, and gave each group a cubicle. When the students were working with key questions, the teachers had to move from cubicle to cubicle to answer questions, give guidance, and help to drive the story forward. This makes the storyline a more student driven teaching method. However, as the students were adult it was also presumed that the students could take more responsibility for the storyline.

Their first task (key question) was to set up a ECEC-institution and employ teachers and staff from the members of the group. The following key questions were all related to daily operation and tasks in their institution, involving the two subjects science and PE. Key questions ranged from how to design an environmentally friendly institution, how to plan a well balanced diet to how to arrange nature hikes for children. Each student group evaluated other student groups' performance in practical tests, and products and theory reflections of their work was collected individually. Since products and theory reflection originating from the key questions were requirements to attend the final exams, each student had a digital folder where all products were stored digitally. The teachers had access to these digital folders, and they proved to be a valuable asset where the teachers could evaluate and give feedback individually to the students about their work.

Each week, when there was no theory lecture, the student groups worked with a set of key questions. Depending on the topic they were working on, the time allocated to each key question set varied between 1 and 3 weeks. The teachers guided the groups, discussed thoughts the students had on the current topics, and placed follow up key questions as necessary. The topics covered the whole curriculum, and literature lists were distributed for each set of key questions. In addition a few theory lectures were held to cover the most difficult theoretical parts of the curriculum.

The control group was given conventional lectures, and covered the same textbooks as the storyline group. The subjects taught at the lectures had similar topics as the key questions given to the storyline group, and covered the same curriculum.

The same multiple-choice-test was given at the start and at end of the study and work as such as a pre- and post-test of knowledge. The test consisted of 30 questions from different topics from the curriculum. A one-way ANOVA performed on the data was done to find difference in knowledge between the storyline- and control-group and within each group to test accumulation of knowledge. Levenes test

	Total		Science		PE	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Control Group	10.0±2.6	11.8±2.4	5.5±1.4	6.0±1.5	4.5±2.0	5.8±1.5
Storyline	9.8±2.5	12.7±2.9	5.2±1.6	6.2±1.6	4.6±1.7	6.5±1.9

Table 1: Pre-&post-test: Average score in the multiple choice test, scores out of a possible 20 ±standard deviation.

	Control	Storyline
A	4.5%	7.5%
B	15.9%	22.6%
C	50%	25.8%
D	13.6%	18.3%
E	11.4%	19.4%
F	4.5%	6.5%

Table 2: The exam grades for the control and test-group, in percent.

for homogeneity was used to ensure the data sets had homogeneous variances before performing the ANOVA (Fox and Weisberg, 2011).

All students were given an exam that contained the same questions, which was graded by two external teachers from another university college. In addition to the grades, each question in the exam was scored on a continuous scale. The scores from the question were used to unravel if there were difference in knowledge between the topics covered in the exam. The non-parametric two sided Wilcox rank sum test was used (R Development Core Team, 2008) as the data did not pass the Levenes test for homogeneity.

There are several methods used to unravel the motivational factors, and a survey was deemed to fit the project best. Most of these are built on the intrinsic and extrinsic motivation theory, see Ryan and Deci (2000) for a overview of classic and modern definitions. There are many strategies to measure motivation, however, in this study Situational Intrinsic and extrinsic Motivation Scale (SIMS) was chosen (Guay et al., 2000). Again a two sided Wilcox test procedure in R (R Development Core Team, 2008) was used to compare the intrinsic motivation of the two groups.

## Result

Data originated from students that had quit during the year were removed from all data sets. After removing these students, the data sets consisted of a total of 137 students exams, 44 students in the control group (40 women and 4 men) and 93 students in the storyline group (82 women and 11 men).

The one-way ANOVA for the pre-test in science and PE showed that there was no difference in knowledge between the two test groups (table: 1). There were no differences between the storyline and control group in the science results in the post-test. The post-test showed that in the result from the science questions, the storyline and control group were more similar compared to the pre-test ( $p=0.94$ , table 1). The post-test for PE showed a positive effect of storyline teaching ( $p=0.007$ , table 1).

All post tests of knowledge had significantly increased knowledge at the end of the year (Storyline group: PE  $p<0.001$  and Science  $p=0.02$ ; Control group: PE  $p<0.001$ , table 1), except science knowledge in the control group ( $p=0.06$ ).

The exam results are presented in table 2. Even if there seem to be different distribution in the two groups, the number of A and F student were too low to run a chi-square test reliably on the data ( $n=2$ ). The one-way ANOVA on the total point score was not significant ( $p=0.054$ ).

Question 1, a pure Science question, the control group was significantly better (table 3). Question 2, a pure Science question, no significant difference. Question 3, a pure PE question, the storyline students were significantly better. Question 4, a pure PE question, the control group was significantly better. Question 5, a mixed question, no significant difference (table 3).

	Control	Storyline	p-value
Q1 Biology	10.8±4.6	7.8±3.4	< 0.0001
Q2 Chemistry	10.4±3.6	11.3±1.7	0.5
Q3 Physiology	4.5±3.7	7.9±4.5	< 0.0001
Q4 Motivation	10.2±4.5	8.1±4.8	0.009
Q5 Dietary	21.0±4.7	19.3±5.8	0.08
Total scores	55.0±19.7	55.6±14.5	0.4

Table 3: The mean scores from each question±standard deviation. The scores is out of a total of 100 points for all questions. The questions were weighted from 15-25 points.

	2008	2009	2010	2011
A	7.5%	1.3%	6.0%	11.8%
B	22.6%	0%	14.3%	19.1%
C	25.8%	10.1%	20.2%	30.9%
D	18.3%	16.5%	16.7%	19.1%
E	19.4%	46.8%	25%	14.7%
F	6.5%	25.3%	17.9%	4.4%

Changes:	Introduction of the storyline.	New P.E. Teacher	New P.E. Teacher No longer strict storyline	New P.E. Teacher
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Table 4: The exam score in the following years, new teachers and changes done to the curriculum.

There was no difference in the students' intrinsic motivation. Only one of the questions of the SIM-scale had significant difference between the two groups. This was one of the external motivation questions («I go to class because I don't have any choice»). This question corresponded more with the control group than with the test group ( $p=0.002$ ).

The students were given four possibilities in the survey to measure how satisfied they were as students, from unsatisfied to very satisfied (In Norwegian: jeg vantrives, jeg trives ikke, jeg trives, jeg trives godt). All respondents chose one of the two positive values. However, 30% of the control group chose very satisfied compared to 55% of the storyline group ( $\chi$ -test  $p=0.015$ ).

The following years the exam scores varied (4), and 2009 stands out with low exam scores. After the low point in 2009 several measures were taken to ensure the quality of the teaching. In 2010 a new arrangement where the students had to complete 2 weeks of practice training at the start of the semester was introduced. Based on experience from former years, the students needed a lot of tutoring to master the storyline method. Thus, due to loss of 2 weeks because of practice training, we decided to abandon the storyline method. The products and the elements of the key questions of the storyline have been kept, and the students are still working in groups with the same assignments as before, but former key questions are now called group assignments, and emphasis is not longer on the story. The exams in 09, 10 and 11 were not scored at sub question levels, so it is not possible to differ the results between P.E. and science.

## Discussion

Starting with the main focus, the multiple choice pre- and post-test did not reveal any difference in knowledge between the two groups in science. However, the post-test showed a positive effect for PE in the storyline group. This may indicate an effect of the storyline method for PE, but our data holds no strong evidence for this to be true.

When looking at exam scores presented in table 2, we found no significant differences. However, some of the exam questions were significantly better for one of the groups (Science: Q1 control group

significantly better, PE: Q 3 storyline group significantly better, Q 4 control group significantly better ). The results does not show any consistency and makes it difficult to point to any difference among the two groups. The lecturers given to the storyline- and control-group differed and might have put different emphasis on different parts within the curriculum, which may offer an explanation for the results.

The control group had the advantage of being second year students and thus were more accommodated to the role of being a student, further they had already had several exams in other subjects. It is possible that these other subjects had given knowledge relevant in PE and Science. The reason for choosing storyline as a method in Science and PE was, as mentioned before, to meet the requirements of a multidisciplinary approach to ECEC. Hence, the exams reflect this multidisciplinary, and the second year students could have profited by this in terms of being more mature and accommodated to this multidisciplinary approach. The small difference in knowledge is not a reason to choose or not choose the storyline method as we see it.

Storyline delivered exam scores comparable to exam scores accomplished by the control group and this study reveals no real differences in the exam scores. However, we feel that traditional lectures should be used to ensure that all students are offered explanations and tutoring of central theories. The adaptations that were made in our storyline were not all successful, and our experience after this study suggests that the students should be mature and have an insight of the storyline method before embarking on a storyline of this scale. It should not have been placed in the students first year. Second or third year may have been better, enabling the students to mature, and become accustomed to being a student. We also think the students would profit from trying a couple of shorter storylines before starting a storyline that lasts a whole year.

When looking on the second focus our data show no increase in intrinsic motivation, thus the intrinsic motivation boost suggested by Bell (1990) are not underpinned by our study. Hence our study contradicts recent studies where the research concluded that in their study the use of storyline had impacted positively on the pupils levels of intrinsic motivation and that pupils' levels of intrinsic motivation had increased during their storyline experience (Mitchell-Barrett, 2010). Our storyline lasted for 10 months with adult pupils in contrast to the one in the Mitchell-Barret (2010) study, which lasted 8 weeks and was performed in a fifth grade class. The time aspect may have influence on the intrinsic motivation. Traditionally a storyline is a happening within a shorter time frame usually of one to three weeks (Eik, 1999), and in the Mitchell-Barret (2010) study 8 weeks, but still a happening in contrast to the pupils ordinary everyday. Our students everyday was in the context of the storyline and not a happening and we suggest that this may be the reason why we found no increase in intrinsic motivation.

The significant difference on the external motivation question, «I go to class because I have to», may indicate that the students in the storyline group feel less pressure to attend the classes, or that they attend less classes. We did not collect attendance data, but the storyline setting were more relaxed, focusing more on the products than hours in the classroom.

The storyline students were more happy in their role as students than the control group. They also did experience a feeling of mastering science and PE, however, based on the results from the multiple choice and exam score they did not have more knowledge of the subjects. It seems that the storyline gave better self confidence, but not necessarily better understanding, or knowledge. The increase in self confidence is positive, but one would want the increase to be linked with increased knowledge.

When looking at the third focus of this study: The implementation of the storyline method after the study took place, the exam scores hit a low point in 2009. The subsequent exchange of teachers in PE, that did not have any storyline experience may have contributed to this. There were not time or money to give the new teachers training in the method and it was left to the teacher to teach themselves the method. The literature is clear on the importance of learning the method thoroughly before embarking on teaching with the storyline method (Eik, 1999) and the failure to do this might have contributed to the bad exam results. The abandonment of the storyline method for more traditional lectures is in many ways not a failure of the storyline method but a necessary change due to external factors, and our present tutoring in PE and science is permeated by elements originating from our storyline.

When embarking on the change of curriculum, it was important that the storyline curriculum should not cost more than traditional lectures. And by adapting the storyline method this was possible. However, we only had access to two lecturers who could follow up the students when they were concerned with

their storyline. It would have been desirable to offer a better support structure to the students. It is conceivable that this would have further increased the knowledge, understanding and intrinsic motivation, however our experiment did not have the funding to unravel these possibilities.

## Conclusion

Our main focus in this study was to reveal the differences between the storyline method and traditional teaching method when instructing theoretical knowledge in science and PE. Our data reveals only slight differences between the groups (based on pre/post multiple choice tests and exam results). Hence we have no unambiguous data that favours neither storyline method nor traditional lecturing from this point of view. The groups differed in some categories, but the results were not consistent, and we suggest they may be a result of the fact that the two groups had different lecturers which might have put different emphasis on different parts of the curriculum, even though they covered the same textbooks and curriculum.

Furthermore, there was no difference between the two groups referring to intrinsic motivation. We suggest the time aspect may offer an explanation to why we did not observe the expected increase in intrinsic motivation in the storyline group. The storyline group everyday setting was in the context of the storyline, and not a happening in contrast to traditionally everyday. However our data revealed that the storyline students were more happy in their role as students, suggesting that the settings of storyline tuition had a positive effect on contentment.

Exam scores and evolving and changing of the storyline model the following years of the study, stresses the importance that the lecturers have good knowledge of the storyline method. On the other hand it also stresses the importance of the students knowledge of the method.

The fact that the present tutoring of science and PE still is permeated by elements originating from our storyline, implies that our storyline in many ways have contributed in a positive way to our present model.

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